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Soil Survey
of
Rensselaer County, New York

By

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and

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Bureau of Chemistry and Soils

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By W. J. LATIMER, United States Department of Agriculture, in Charge, and C. H. DIEBOLD, WILBER SECOR, C. P. MEAD, and MONTAGUE HOWARD, Jr., Cornell University Agricultural Experiment Station

INTRODUCTION

Rensselaer County embraces 651 square miles in eastern New York. The population in 1930 was 119,781, of which 31,040 were classed as rural. The county has excellent transportation facilities and good markets. Physiographically the area consists of two plateaus—one in the southeastern corner of the county (the Rensselaer Plateau), flanked on the east by a higher mountain range (Taconic Mountains), and a lower plateau or lowland (Hudson Valley, or lowlands)[1] covering the rest of the county, bordered on the west by the deeply entrenched Hudson River Valley. The plateaus are divided by well-defined escarpments. The Hudson River lowlands range from 300 to 800 feet above sea level, the Rensselaer Plateau from 1,200 to 1,800 feet, and Taconic Mountains from 1,500 to 2,500 feet. The general trend of the slope is westward. Although the relief in general is smooth, the surface of the lowlands presents a choppy appearance and the Rensselaer plain is broken and rough in places. Most of the county is well drained.

The climate is continental and humid, with long cold winters and short hot summers. The range in climatic conditions from the Hudson Valley to the top of the Rensselaer Plateau is wide. The climate in general favors the growth of grass and small grains, which is advantageous to livestock raising and dairying, and it is also favorable for growing fruits and vegetables.

The entire section was at one time glaciated, and the glacial material ranges from deep till on drumlins to thin till deposits, and includes extensive areas where the surface material was removed, leaving bare rock outcrop. Much outwash material from the melting glacier was deposited in the valleys as terraces and kames; lakes were formed in basins where the glacial waters left much fine material—clays and silts; and later the present streams deposited alluvium on the flood plains.

The development of the soils has been determined according to lithological material, composition, mode of deposition of the parent rock material, and subsequent conditions of drainage and climate.

The soils of this section are not leached to the same extent as the soils of the South, but they have lost more of their soluble materials than the soils of the Great Plains region, for example.

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[1] The name Hudson Valley, as used in this report, refers to the lowland or low plateau. Hudson River Valley is used to designate the trench occupied by Hudson River, its present flood plain, and the recent terraces. For further information see United States Geological Survey Bulletin 272 (2)[2] and New York State Museum Bulletin 285 (*12*).

[2] Italic numbers in parentheses refer to Literature Cited, p. 70.

The well-drained upland soils may be placed in two main groups as determined by characteristics brought about by the climatic and environmental conditions under which they have developed. The soils of the Rensselaer Plateau and Taconic Mountains belong to the true Podzol soils of the North, but the soils in the rest of the county belong to the Gray-Brown Podzolic group.

The true Podzol soils occur mainly above an elevation of 1,500 feet, under a forest cover or where a forest duff existed, and a well-defined gray layer or leached zone has developed. This layer is underlain by a brown or yellow-brown zone of accumulation. In the rest of the county the tendency of the organic matter to accumulate on the surface is less pronounced, and, instead, the organic matter of the surface layer is more or less mixed with soil.

The Podzol soils of the higher land—the Hermon, Danby, and Macomber soils—are in general stony and covered by forest, but where cleared they are used mainly for pasture. The Woodbridge soils, although very stony, are used for crops and pasture. The Whitman soils are the poorly drained soils of this group.

The soils of the lowlands, or Gray-Brown Podzolic soils, include a large number of soils which may be divided into two subgroups, based mainly on the mode of deposition of the parent material—those developed from glacial till and those from outwash and terrace materials. In the first group, the Cossayuna, Troy, Albia, Dutchess, Bernardston, Culvers, Stockbridge, Pittsfield, and Gloucester are well-drained soils; the Boynton and Alps are imperfectly drained soils; the Mansfield are poorly drained soils on the deep or medium deep till; and the Nassau soils are developed from thin till derived from shale and slate and in part residual.

In the second group, the soils developed on the smooth terraces from gravelly and sandy material belong to the Hoosic and Copake series, and those from the silty and clayey material to the Hudson, Orono, and Claverack series.

The soils of the bottom land are divided into the Ondawa and Genesee soils which are well drained, the Eel and Podunk soils which are imperfectly drained, and the Saco soils which are poorly drained.

Miscellaneous land types include muck, peat, marsh, alluvial soils (undifferentiated), and made land, in addition to rough stony land and rock outcrop, which are confined to the Rensselaer Plateau and Taconic Mountain section and have little or no agricultural value.

The soils of Rensselaer County are well suited to the production of grasses and clover, and for this reason livestock have always been produced, at first largely cattle and sheep for beef and mutton, and later dairy herds. At present dairying is the chief type of farming, and most farming operations center around the production of crops utilized in dairy feeding. Market gardening, orcharding, and poultry raising are side lines.

The crops produced are hay, principally timothy and clover, and some alfalfa, together with much quackgrass, crabgrass, and noxious weeds in old meadows, corn for silage and grain, oats, rye, buckwheat, potatoes, and sweet corn, and other vegetables. Apples and pears are the principal orchard fruits, and strawberries are the leading small fruit. A large acreage is maintained in pasture consisting of poverty grass, bentgrass, and bluegrass, with much hardhack

(*Spiraea tomentosa*), brushy cinquefoil, and sweetfern, according to location. Abandoned fields are growing up to birch and aspen sprouts.

Land near the population centers of the State capital district is used for market gardening more than that in other parts of the county. Dairying is followed in all parts except the Rensselaer Plateau and Taconic Mountains. Commercial fruit growing is developed mainly in the southwestern corner.

COUNTY SURVEYED

Rensselaer County is located in the eastern part of the State of New York, between Hudson River, which forms its western boundary, and the New York-Massachusetts and New York-Vermont State lines (fig. 1). The southwestern part of the county is across Hudson River opposite Albany, the State capital. In shape the county is an irregular rectangle, measuring about 20 miles from east to west and 30 miles from north to south. It includes a total area of 651 square miles, or 416,640 acres.

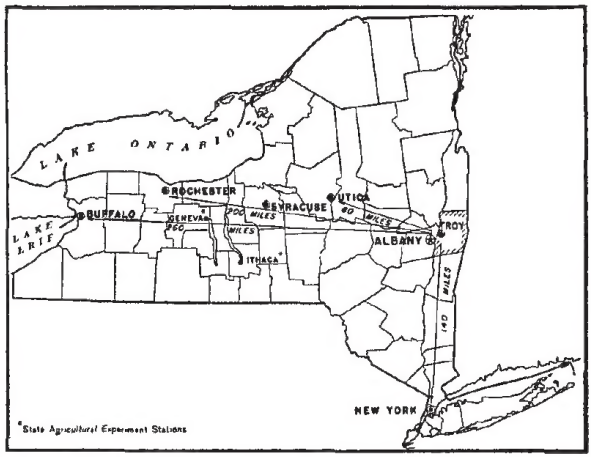

FIGURE 1.—Sketch map showing location of Rensselaer County, N. Y.

Physiographically the county consists of an extensive lowland or low plateau, known as the inner lowland, or Hudson Valley, which slopes gently westward from the escarpment of the high plateau occupying the southeastern third of the county and the base of the northern extension of the Taconic Mountains, which flanks the high plateau on the east. This lowland lies at an average elevation of 800 feet along its eastern border, sloping to about 500 feet along its western border near the western limits of the county. The high plateau, or Rensselaer Plateau, rises rather abruptly from 500 to 600 feet above the lowlands. The surface of the plateau, like that of the lowlands, slopes gradually westward, from an elevation ranging from 1,600 to 1,800 feet in the eastern part to an elevation ranging from 1,200 to 1,400 feet in the western part. East of the high plateau and separated from it by a comparatively narrow longitudinal valley, an arm of the lowland, lies the still higher Taconic Mountain range, rising to an average height of 2,500 feet, as far north as a line coinciding with the northern end of the plateau, beyond which it forks and degenerates into a series of low ridges west of the longitudinal valley, and an isolated mountain, ridges, and hills east of the valley.

The escarpment of the high plateau, at the point where it adjoins the Hudson Valley on the west and north, is sharp and marked by a steep and stony face in most places, but the bases of the Taconic ridges slope more gently to the level of the lowlands.

The Hudson Valley, or lowland belt, has reached an advanced stage of physiographic development, as most of the hills are smooth, the stream valleys broad, and the slopes gentle, although, owing to hard more resistant rock materials, a number of monadnocks, or high isolated hills, occur. Among these, Mount Rafinesque (1,197 feet) and Rice Mountain (1,000 feet) in the northern part of the county and Curtis Mountain (1,160 feet) in the southern part are the most prominent. Although the local irregularity of the surface is mainly caused by the differences in resistance of the rocks to weathering, the irregularity of the glacial deposit is responsible to some extent. Most of the smoothly rounded hills are the result of deep glacial deposits, or drumlins, whereas the thin till deposits hide, to some extent, the ragged rib rocks in many hills, which in extensive areas that have no till deposits are exposed and give to the lowland belt its wavelike and choppy appearance.

Along the entire western border of the Hudson Valley, or lowlands, and separated from the rest of the lowlands by a well-defined escarpment ranging from 100 to 200 feet in height, is a definitely lower belt, ranging from 1 to 5 miles in width, that slopes westward from an average elevation of 300 feet to an elevation of 200 feet along the outer edge, upon which the thin deposits of sands, silts, and clays of old Lake Albany were deposited. Into this deposit and into the soft shale bedrock below, Hudson River carved a trench 200 feet below the level of the plain and about 1 mile wide, upon which the present flood-plain and terrace materials have been deposited and in which the present stream flows at sea level along its lower reaches and from 20 to 60 feet above sea level farther upstream.

The well-developed lateral streams have cut well down to the level of the Hudson trough in this belt, and the smaller streams have cut narrow V-shaped tonguelike valleys from 1 to 3 miles back into the otherwise smooth surface of the old lake plain. The lateral streams entering Hudson River above the well-defined drop into the Hudson trough flow through comparatively broad but shallow hanging valleys. Hoosic River has developed a valley fairly uniform throughout its course across the county, ranging from one-half to three-fourths mile in width. The other streams have narrower but irregular valleys which contain many lakes, filled-in lake basins, and low, mucky, and swampy bottoms.

The surface relief of the Rensselaer, or "grit", Plateau is fairly intact, the land having suffered little from erosion, except around the outer edges where streams have cut back into the level of the plateau, although many hills rise several hundred feet above the general level of the plateau, and knolls stand out along the edges where erosion has reduced the surrounding territory. Many lakes and an extensive area of poorly drained and imperfectly drained land occur in the interior, more level parts of the plateau. The highest point on the plateau is near Berlin Mountain (2,123 feet above sea level) on the eastern side of the plateau near the town of Berlin. The general appearance caused by the stone and forest is that of a rough though not rugged area.

The Taconic Mountains extend in an unbroken range along the eastern border of the county, for a distance of 20 miles north of the southeastern corner, as a high, narrow-topped mountain range averaging 2,500 feet in height, and ranging from 2,000 feet in the gaps to a maximum of 2,804 feet on Macomber Mountain, the highest point in the county. This ridge is flanked by transverse spur ridges which extend from 1 to 4 miles from the main ridge and range in elevation from 1,500 to 2,000 feet at the base of the spur to 1,000 feet on the nose. Most of the ridges are separated by narrow, V-shaped, deeply cut valleys which gradually widen as they merge with the longitudinal valley separating Taconic Mountains from the grit plateau. In places the valleys are broad and include amphitheaterlike basins which are in general higher than the main valleys. The surface relief of most of the Taconic Mountains is steeply sloping, with here and there a somewhat flattened ridge and a gently sloping base around the nose of the ridge. The northern extension of the Taconic Mountains north of Hoosic River is interrupted by many broad longitudinal transverse valleys, similar to Hoosic Valley, which have smooth relief. The southern end of the long, narrow valley separating the mountain range from the plateau widens perceptibly in the southern part of the county into the Stephentown Valley. Topographically this is a counterpart of the northern end of the valley. Numerous terraces having smooth surface relief are scattered over much of the county, mainly along the stream valleys, and are especially well developed along Hoosic River. Where this stream breaks from the level of the Hudson Valley to the Hudson River trough, five distinct terrace levels, which have steep escarpments along their outer, or stream, edges, are developed above the flood plains.

Drainage is effected through the Hudson River system, the northern part of the county draining through Hoosic River, the main tributary of the Hudson in this county, and the rest draining through a number of lateral streams directly into Hudson River. As already stated, the tributary streams to the Hudson flow through hanging valleys and have low gradients, except where they break from the low plateau to the Hudson River trough and where the streams, except Hoosic River, break from the high grit plateau to the lowlands. Only immediately below the breaks have the streams cut narrow, deep V-shaped valleys.

On top of the Rensselaer Plateau and on the stream bottoms of the lowlands, or Hudson Valley, are many low, swampy areas, the result of retarded drainage. The flood plains of the main streams, aside from a few marshy places affected by tides on the lower reaches of the Hudson and a few low spots in the back bottoms, are well drained.

Rensselaer County lies in the transitional zone where the forest flora of the East Central States—ash, chestnut, hickory, and poplar—blends with the flora of the Northeastern States—white pine, hard maple, beech, birch, and hemlock—and the spruce of the northern coniferous forest begins to come in on the higher elevations (*13*). This section of the State was originally covered with a dense and vigorous forest with little underbrush. Certain types of tree associations dominated the different physiographic regions and also affected the topographic and soil differences (*1*). Trees of the south-

ern flora dominate in the Hudson Valley, whereas trees associated with the northern flora predominate on the Rensselaer Plateau and Taconic Mountains (*12*).

That considerable change in the character of forest growth has taken place is borne out by a comparison of the present growth in certain areas with that mentioned in earlier records. The sandy areas in the northwestern part of the county originally supported a heavy growth of white pine and oak with little underbrush, but at present these areas support much pitch pine, scrub oak, gray birch, and a dense underbrush, mainly of huckleberries. The scattered wood lots and isolated trees remaining on the heavy soils of the lake plain point to a very heavy stand of hardwoods, such as red oak, white oak, American elm, hickory, and white ash. The Hudson Valley, or lowland, is a region of mixed forest consisting of white pine, red oak, white oak, chestnut, ash, poplar, hard maple, and other hardwoods. On the grit plateau, much of the forest consists of second-growth trees, principally hard maple, yellow birch, white birch, white pine, beech, red oak, hemlock, and spruce. The Taconic Mountains, in addition to these trees, contain much chestnut oak, chestnut (dead), and gray birch. The limestone valley, in addition to the hardwoods of the Hudson Valley, contains much walnut, ash, and butternut. Scattered throughout the county are such trees as aspen, basswood, beech, striped maple, shadbush, gray birch, and ground juniper; in low, poorly drained areas, such plants as alder, soft maple, and tamarack; and in the stream valleys, sycamore, buttonbush, willow, and hornbeam. Over the Hudson Valley, along fence rows, wild cherry, chokecherry, and panicled dogwood abound, and poison-ivy, or poison-oak, is common in woods and in fence rows.

Many varieties of blueberries, both of high- and low-bush and of early and late-maturing varieties, grow on the highlands and also over the lowland but in less profusion, and huckleberries are common in the sandier places. Neither blueberries nor huckleberries grow to any extent in the limestone valleys. In the damp woodlands of the higher areas, clubmoss and other varieties of *Lycopodium*, such as groundpine, are common, together with a wide variety of ferns, and Sphagnum moss is common in very low wet places. Wintergreen grows in woodlands in all parts of the county. Many patches of wild red raspberries abound in abandoned clearings in the highlands, and blackberries grow in wooded areas. The common black raspberries and dewberries are more widespread.

Hardhack, or steeplebush (*Spiraea tomentosa*), is the most widespread plant in the pastures. Sweetfern, meadowsweet, pasture rose, hawthorn or thorn apple, sumac, and patches of fern grow extensively in pastures but are not so troublesome as steeplebush. Shrubby cinquefoil is the principal pasture pest of the limestone valleys. Common noxious weeds are running cinquefoil, orange hawkweed (devil's-paintbrush), yellow hawkweed, wild thyme, peppergrass, charlock, parsley, wild carrot, wild mustard, wild parsnip, and a weed similar to ironweed (confined to river bottoms), lady's tobacco (*Antennaria*), mullein, Canada thistle, common yellow and oxeye daisy, and horseweed, chickory, and blueweed (or blue thistle) sometimes known as blue devil, on land derived from limestone. Common grasses are Kentucky bluegrass, Canada blue-

grass, mainly in the Hudson River Valley and limestone valleys, and bentgrass and sweet vernal, mainly on the high plateau and limestone valleys and to some extent in the Hudson Valley. Poverty grass is widespread outside the limestone valleys, particularly on worn-out land. Meadow fescue, creeping bent, oatgrass, and orchard grass are well scattered over the county. Timothy and redtop, usually seeded, are widespread volunteer grasses. Quackgrass, diffuse and common crabgrass, chess, foxtail, and barnyard grass are widespread pests. Common legumes, in many places seeded but also widespread as volunteers, are alfalfa, white sweetclover (*Melilotus alba*), common white or Dutch clover, mammoth red clover, common red clover, alsike clover, yellow or hop clover, rabbit clover, and black medic. Low wet areas support a growth of cattail, bulrush, reeds, and many sedges, and wildrice grows among the marsh grasses along the Hudson River tidal flats.

In 1630 the agents of the Dutch patroon, Van Rensselaer, purchased from the Mohican Indians most of the territory now included in Rensselaer County, and during the year settlements were made along Hudson River at Schodack. Other settlements followed at Schaghticoke in 1707 and at Hoosic in 1725. All the early settlers were Dutch.

Rensselaer County was formed from Albany County in 1791 and divided into 7 towns which have been further divided until at present the county includes 14 towns and 2 independent cities. The population in 1930 was 119,781, of which 25.9 percent was classed as rural. The rural population has a density of 46.8 persons a square mile. The towns and cities along the western edge are included in the metropolitan capital district and contain a large industrial population. Although the original settlers were Dutch, a strong infiltration of English from New England has taken place, especially in the eastern part of the county. French Canadians, Irish, and Scotch came in large numbers during and following the railroad-building and canal-digging period about the middle of the nineteenth century. In recent years a number of Poles, Hungarians, and Italians have come into the county, mainly to the industrial towns. The rural population is descended largely from the original settlers, although many people of foreign birth or extraction are living on farms at present, and increasing numbers are taking up farming.

Troy, the county seat, with a population of 72,763 in 1930, is the largest and by far the most important city. It is located at the head of navigation on Hudson River and occupies a strategic position at the eastern terminus of the New York State Barge Canal (Erie Canal) and the southern end of the Hudson-Champlain Barge Canal. It is an important manufacturing town and educational center. Among the leading articles of manufacture are collars, shirts, valves, engineering instruments, and surveying instruments. Rensselaer Polytechnic Institute, the oldest engineering school in the United States, is located in this city. Rensselaer, on the Hudson River opposite Albany, is a manufacturing and railroad town having a population of 11,223 in 1930. Hoosic Falls, in the northeastern corner of the county, is a small manufacturing town having a population of 4,755 in 1930.

Water and rail transportation facilities are ample. Hudson River is navigable for ocean-going vessels to Troy, from which place two large canals give excellent transportation to the west and north. Five railroad lines enter the county—the New York Central, the Boston & Albany, the Boston & Maine, the Delaware & Hudson, and the Rutland—furnishing railroad facilities to practically all sections.

The public-road system is good. There are approximately 280 miles of paved roads, and the rest are largely gravel surfaced. Even on the Rensselaer grit plateau and Taconic Mountains, where most of the roads are unimproved, some are surfaced with gravel and some are paved. Road conditions have materially improved within the last few years, and fully half the farms are located on improved roads.

Telephone service is available to about one-half of the farms. A large number of hydroelectric plants, which furnish power locally and to adjacent areas, are located within the county.

CLIMATE

Rensselaer County has a humid, modified continental type of climate marked by long, cold winters and short, warm summers. It is not subject to the extremes of heat and cold as is the interior of a great continent. The average annual temperature at Troy is 48.8° F., the annual average precipitation is 35.57 inches, and the average frost-free season extends over a period of 174 days. The United States Weather Bureau station at Troy is only 35 feet above sea level, and, although the records from this station are representative for the Hudson River Valley, they are not representative of the Hudson Valley, or lowlands, which range from 500 to 750 feet above sea level, and are widely different from the records of weather conditions in the highlands, including the Rensselaer Plateau, which ranges from 1,500 to 1,800 feet above the Hudson River Valley; and in the Taconic Mountains, which rise from 500 to 1,000 feet above the plateau.

No specific climatic data are available for the highland area, although it is well known that the average annual temperature is lower than in the Hudson Valley or Hudson River trough, the precipitation is greater, and the frost-free season is shorter. If the figure of 1° F. change for each 300 feet elevation be accepted (*11*), the Rensselaer Plateau would have an average temperature about 5° lower than the Hudson River Valley. The differences in the weather conditions of the different physiographic divisions are better brought out by the regional weather chart (*8*).

The Hudson lowlands lie in the zone that has from 35 to 40 inches precipitation and the highlands, or the Rensselaer Plateau, is in the zone having from 40 to 45 inches. The Hudson River Valley has an average temperature of 62° F. for the active growing season, and the rest of the county is credited with a mean temperature of 60° during the same season. In the Hudson River Valley the average date of the last killing frost is between April 20 and May 1; in the Hudson Valley, or lowlands, between May 1 and May 10; and in the rest of the eastern part of the county, between May 10 and May 20; and the average date of the first killing frost for the Hudson River Valley is between October 10 and October 20 and for

the Hudson Valley and highlands between October 10 and October 17.

The length of the frost-free season shows more clearly the differences in the climate of the respective physiographic divisions. In the Hudson River Valley it is from 160 to 170 days, in the Hudson Valley from 150 to 160, and in the highlands from 140 to 150. Although this county is within the belt where the rainfall is heavier than in other sections of the State, periods of 20 days have often occurred between March 1 and September 16, during which the rainfall has been very slight. The annual snowfall ranges from 40 to 60 inches. The mean relative humidity (annual) at Albany is 78 at 8 a. m. and 71 at 8 p. m.

Climatic conditions on the highlands favor the accumulation of organic matter on the surface, but conditions on the lowlands have this tendency to less degree, and the indications are that the organic matter is destroyed rapidly when exposed. The climate is well suited to forestry and the growing of a wide variety of crops, including grasses. The growing season is of sufficient length to mature most of the crops of the Temperate Zone, and the rainfall is sufficiently heavy to cause erosion on sloping land where the soil is not well managed, especially where the substratum is compact enough to prevent free movement of water downward.

Table 1 gives the more important climatic data, as recorded at the United States Weather Bureau station at Troy.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Troy, Rensselaer County, N. Y.*

[Elevation, 35 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1839)	Total amount for the wettest year (1878)
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*
December	27.9	68	−16	2.44	3.26	4.70
January	22.9	74	−15	2.34	1.00	3.94
February	24.6	71	−15	2.19	.15	3.72
Winter	25.1	74	−16	6.97	4.41	12.36
March	34.0	76	2	2.42	.58	1.94
April	46.0	89	16	2.80	1.24	4.53
May	60.1	97	25	3.14	.92	4.60
Spring	46.7	97	2	8.36	2.74	11.07
June	69.3	99	38	3.72	2.65	4.68
July	74.4	108	40	3.78	2.19	6.12
August	72.4	102	40	3.35	.92	3.80
Summer	72.0	108	38	10.85	5.76	14.60
September	63.6	98	31	3.20	2.59	2.63
October	51.8	88	22	3.29	1.70	3.32
November	38.4	77	9	2.90	1.12	5.18
Fall	51.3	98	9	9.39	5.41	11.13
Year	48.8	108	−16	35.57	18.32	49.16

AGRICULTURAL HISTORY AND STATISTICS

Practically all of Rensselaer County south of the northern tier of towns, was acquired through grants by the Van Rensselaer family and was held by them up to the middle of the nineteenth century, when it was lost because of disaffection of the tenants and legislation unfavorable to the landlords. These conditions caused unsettled agricultural conditions in the parts of the county affected. During this rental period much land was cultivated and overgrazed, with little attention given to protection of the surface soil, which resulted in a large area of the sloping land suffering from sheet erosion (*14*).

In the extreme northern part, this condition did not exist, and, although some erosion resulted from cultivation, the farms generally were handled better from the beginning. Although the history of the entire county for the last 75 years has been much the same, the agriculture of the southern towns began reviving on much depleted land about 1850, whereas the northern tier of towns started this epoch with the advantage that the land was fairly well preserved.

The early agriculture (*4*) consisted of growing the general farm crops—corn, wheat, rye, oats, peas, potatoes, flax, clover, and timothy—and the raising of cattle, sheep, and hogs. Eaton states that excellent yields were obtained by the leading farmers, and he gives much advice about planting and handling the different grades of land then recognized (1823). It is further stated that, notwithstanding the fact that this country can grow grass well and is well suited to dairying, it was only slightly developed. The following crop rotations were in use at that time: Where land was loam or sand (not clay or mountain)—(1) winter wheat, (2) corn, (3) spring-sown crop (barley, oats, peas, flax, spring wheat, and spring rye), and (4) timothy and clover, mowed or pastured for a few years; on the clay or yellow loam with hardpan—(1) potatoes and corn, (2) spring-sown crop (oats, barley, peas, and flax), (3) winter rye or wheat or spring wheat or rye, and (4) clover or timothy mowed or pastured for 4 to 6 years. According to Eaton, all parts of the county were productive of either grass or clover. The mountains were excellent for oats, barley, flax, potatoes, turnips, beets, and carrots. Stable manure and muck manure were used, and gypsum, land plaster, and wood ashes were applied to the land. It was considered that the river-bottom land was the standard of excellence and needed no additions for producing crops, as it would maintain yields of 25 or 30 bushels of wheat every other year where alternated with peas, oats, or flax. Some bottom land was cultivated to corn every fourth year—(1) corn or potatoes, (2) spring-sown grain, and (3) wheat. The mountain meadows were overrun with mountain polypody after being mowed for 6 or 8 years. Very few farmers grew buckwheat, although this was recognized as a good crop to control noxious weeds, such as oxeye daisy, buttercup, Canada thistle, and quackgrass (*4*).

Sheep raising became general in the early part of the nineteenth century, but it began to decline with the opening of the western range land and has now reached a very low level. The raising and fattening of beef cattle began to decline when the railroads reached

the Plains country. Dairying has taken the place of raising beef cattle and has increased with the urban development of the East.

The corn acreage increased from 9,735 acres in 1889 to 14,088 acres in 1899, but dropped to 10,508 acres in 1929. Nearly half of the corn is cut for silage, and this usage has increased during the last two decades. The acreage in oats decreased about 50 percent during the period 1889 to 1929. Wheat, which ceased to be an important crop as early as 1879, increased in acreage slightly during the World War, but it has decreased since to the level of the preceding decade. The acreage of rye decreased from 18,020 acres in 1899 to about 2,000 acres in 1929, and buckwheat from 3,792 acres in 1899 to 1,946 acres during the same period. The decline in the acreage of buckwheat is owing mainly to land abandonment, as this was a crop much grown in the highlands. Rye is not an important harvested crop, but it is used extensively as a cover crop. The acreage in hay, mainly timothy and clover, decreased from 98,817 acres in 1889 to 64,347 acres in 1929, owing mainly to the reduced demand for hay on account of replacement of the horse by gas-driven machines. Of the hay crops, alfalfa alone shows an increase from 115 acres in 1919 to 1,687 acres in 1929, owing to the popularity of this crop for feeding dairy cattle. Potatoes show a decrease from 14,973 acres in 1879 to 3,533 acres in 1929, owing principally to competition from Maine and to the chain-store method of distribution.

The present-day agriculture consists mainly of growing such crops as serve to maintain dairy farms, as corn (for silage and forage) and hay (timothy, redtop, clover, and alfalfa), supplemented by such crops as corn (for grain), oats, rye, and buckwheat; the growing of vegetables—sweet corn, potatoes, tomatoes, cucumbers, cabbage, and beans—for market; and the production of small fruits, such as strawberries and raspberries, and orchard fruits, mainly apples and pears.

A fairly large area of pasture is maintained. The pastures are made up of Kentucky and Canada bluegrass, Rhode Island bent, creeping bent, sweet vernal, and poverty grass, together with many noxious weeds. Much of the former pasture land in the rougher section, which was used for sheep and cattle, has grown up in forest, and much more is being rapidly encroached upon by white pine, gray birch, sumac, blueberries, huckleberries, and thorn apple. Much of the present pasture land contains *Spiraea*, brushy cinquefoil, sweetfern, and bracken. On many farms, mowings have been abandoned to pasture, and this accounts for the rather high proportion of plowable pasture in some towns.

Prior to the prevalent use of automobiles, a large number of horses were kept in Troy and Albany, and these furnished a ready supply of manure to the territory within easy hauling distance from these cities. This supply of stable manure provided much of the organic fertilizer necessary for the maintenance of the productiveness of the soils. Because of the decreased supply of manure the farms began to be less productive, and those on which dairying was not carried on, thereby providing a supply of manure, failed as producing units and many were abandoned. This accounts for much of the depleted land in the lowland section southeast of Troy and east of Albany, lying west of the Rensselaer Plateau escarpment. The long-continued use of stable manure on this and other land without the addi-

tion of phosphatic fertilizer, together with sheet erosion in some places, has resulted in depletion of the phosphate content of these soils and the poor vegetal cover on much of this land. This condition also exists even on many of the modern dairy farms where commercial fertilizers are not used.

According to the 1880 census, 97.1 percent of the county was in farms, of which 86.2 percent was improved land. In 1930, only 63.3 percent was in farms, with 61.8 percent improved land. The census figures indicated a rapid decline between 1880 and 1890 and between 1920 and 1930, not only in total area in farms but in the area of improved land. This reduction in the area farmed is reflected in the abandoned farms in the rougher parts of the Rensselaer Plateau and Taconic Mountain sections and to curtailment of farming in all sections, particularly in the hill section around the base of the Rensselaer Plateau.

The following tabulation shows the amount of land in farms and its general utilization in 1929:

	Acres
All land in farms	268,552
Crop land, total	124,000
Crop land harvested	96,778
Crop failure	4,074
Idle or fallow land	23,148
Pasture land, total	92,625
Plowable pasture	42,087
Woodland pasture	25,118
Other pasture	25,420
Woodland not pastured	36,137
All other land in farms	15,790

The acreage devoted to the principal crops in 1929 is set forth as follows:

Crop	*Acres*
Corn:	
Harvested for grain	3,827
Cut for silage	4,622
Cut for fodder	1,841
Hogged or grazed off	218
Oats:	
Threshed	7,875
Cut and fed unthreshed	888
Buckwheat	1,946
Wheat	121
Barley	172
Rye	1,996
Potatoes	3,533
All hay	64,347
Timothy and (or) timothy and clover mixed	41,151
Clover	3,978
Alfalfa	1,687
Other tame grasses	16,479
Wild grasses	651
Small grains cut for hay	126
Annual legumes cut for hay	275
Vegetables harvested for sale	1,273

Table 2 gives the value of crops and livestock products produced in 1929 and the value of domestic animals on April 1, 1930.

TABLE 2.—*Value of all farm products, by classes, in Rensselaer County, N. Y., 1929, and of domestic animals on April 1, 1930*

Crops	Value	Livestock and products	Value
Cereals	$291,521	All domestic animals	$2,689,683
Other grains and seeds	3,038	Dairy products sold	2,009,865
Hay and forage	981,291	Wool, mohair, and goat hair	26,672
Vegetables, including potatoes	430,654	Poultry and eggs	1,094,829
Farm-garden vegetables (home use only)	78,397	Bees and honey produced	23,046
Fruits and nuts	234,756		
Nursery and greenhouse trees and plants	92,098	Total	5,844,095
Forest products	254,487		
Total	2,366,242	Total agricultural products	8,210,337

The 1930 Federal census reports the following numbers of livestock on farms on April 1 of that year: 4,036 horses, 59 mules, 24,989 cattle, 12,516 sheep, 110 goats, 3,168 swine, 184,221 chickens, and 2,072 hives of bees. The census also reports 1,765 turkeys, 18,389 ducks, and 1,152 geese raised in 1929.

The number of beef cattle and sheep kept on farms has markedly decreased since 1880, but the number of dairy cattle has increased, although not sufficiently to take up all the range formerly occupied by beef cattle. In 1929, according to the census report, 14,298 cows were milked, producing 9,537,640 gallons of milk, 80 percent of which was marketed as whole milk and the rest sold as cream and butter or used at home. Of the 349,008 pounds of butter produced, 256,471 pounds were sold; 7,412 pounds of cream were sold as butterfat; and 23,454 gallons of cream were sold as cream. The value of dairy products constitutes almost 40 percent of the farm income.

Holstein-Friesian is the leading breed of dairy cattle, and some Jerseys, Guernseys, and Ayrshires are kept. Most of the dairy cattle are purebred. Most of the herds are small, ranging from 10 to 20 cows, although some farmers keep 30 or more. Nearly every farmer milks some cows, usually 5 or 6. Most of the horses are of semidraft types and are well suited to the farm work. The swine are Duroc-Jersey, Chester White, and Berkshire. Although sheep are kept mainly for the production of mutton and spring lambs, the breeds include both dual-purpose and mutton types. Little attention is given to wool types, although on a few of the estates purebred sheep of the wool types are kept. The popular breeds of chickens are Rhode Island Red and Barred Plymouth Rock on the farms where poultry is sold, and White Leghorns are kept for broilers and egg production.

Commercial fertilizers are not in general use on most of the dairy farms, as there is an ample supply of manure to apply to sod before turning it under for corn. Manure is applied at a rate ranging from 10 to 20 tons an acre as far as it will go. Many farmers do not use commercial fertilizer, even for potatoes, but most of them use burned lime or ground limestone at the rate of 1 or 2 tons an acre. Many farmers on the clayey soils bordering the Hudson River Valley do not use lime. The fruit growers of the lower Hudson Valley use nitrate of soda applied at the rate of 10 or 15 pounds to each tree.

and the market-gardeners use commercial fertilizer in large quantities. The farmers of the Hoosic Valley use commercial fertilizer on corn, oats, buckwheat, and potatoes. The number of farms reporting the purchase of fertilizer in 1929 was 1,128, or 44.5 percent of all farms, at a total cost of $79,858, which included the cost of all commercial fertilizers, manure, marl, lime, and ground limestone. The following grades and acre applications of commercial fertilizer are used: For general use, 3–8–4 [3] or 2–10–4 grades, at the rate of 150 to 200 pounds; corn fertilizer, 2–12–4, from 200 to 300 pounds; small grains, 2–10–2 or 1–9–4, 200 pounds, or 16- to 20-percent superphosphate, from 250 to 350 pounds, and many farmers use superphosphate and nitrate of soda separately; for vegetables, 8–4–4 or 5–8–7, from 500 to 600 pounds; for potatoes, 5–8–7, 4–12–4, or 2–8–10. Little fertilizer is mixed on the farms, most of it being purchased ready mixed.

The farmers located on the sandier soils, such as the Hoosic, Copake, and Claverack, formerly used larger quantities of complete fertilizer than did farmers on the heavier soils, such as the Hudson, Troy, Cossayuna, Dutchess, and Bernardston, who depended largely on manure, with some lime, superphosphate, and complete fertilizer. When complete fertilizers were used on these heavier soils they differed only in quantity from those used on the sandier soils. At present, however, there is no general system of fertilizer usage. The crop is usually considered before the soil, and the economic condition or financial status of the individual farmer outweighs all other factors.

In 1929, 2,185 farms reported the purchase of feed at an average expenditure of $569.85 a farm. The feed consists mainly of feed for dairy cattle and poultry.

The hire of farm labor in 1929 was reported by the census on 51.6 percent of all farms, at an average cost of $383.99 a farm. Labor, owing to lessened industrial operations and lessened demand for farm labor, is cheap compared with that of a few years ago. Much of the farm work was and still is performed by the farmer and members of his family. Efficient farm labor is not plentiful even under present conditions, as most industrial employees are not qualified for farm work. Farm wages range from $1 to $2.50 a day. Most of the laborers hired on the dairy farms are full-time employees hired by the month, and their pay includes other perquisites besides cash. Seasonal labor, such as apple and fruit picking and market-garden work, commands a higher wage than ordinary farm work.

The number of farms decreased from 3,078 in 1920 to 2,533 in 1930, but the average size increased during the same period from 99.9 acres to 106 acres. The greater number of farms are included in two groups—832 farms, ranging from 100 to 174 acres in size; and 757 farms ranging from 50 to 99 acres. Only 340 farms include more than 175 acres each, and only 1 exceeds 1,000 acres.

Although some farms have been abandoned in the rougher sections, many have been absorbed by adjacent holdings and, as is natural under these circumstances, some curtailment of farm operations has resulted.

[3] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

The farms operated by owners increased from 76.4 percent in 1890 to 91.2 percent in 1930. This shows a very small proportion of tenant-operated farms. Only 0.1 percent is operated by managers. The terms of tenure differ considerably, ranging from farms rented for cash to merely temporary retreats for industrial employees out of work. Of the 220 tenants in 1929, 155 were cash tenants paying an average of $2.32 an acre. The terms of tenure of the remaining 65 tenants range between wide limits, differing with the contracting parties. Under present conditions the half-share system, at one time in vogue, has practically broken down.

The better equipped farms are supplied with labor-saving machinery, including reapers, binders, threshers, corn cutters and shredders, hayrakes, side-delivery rakes, hay loaders, hay tedders, mowing machines, manure spreaders, rollers and cultipackers, grain and fertilizer drills, sulky plows and cultivators, turn plows, harrows, drags, and an assortment of small plows and hand tools. The 1930 census reported 2,172 automobiles, 988 motortrucks, 427 tractors, 401 electric motors, and 619 stationary gas engines on the farms. Telephones were in use on 1,171 farms, 977 farm homes had water piped to the house, and 869 were lighted by electricity.

The average price of farm land increased between 1920 and 1930, which is contrary to the trend of land values in other sections of the State. This is probably due to the fact that a large part of the county lies near Albany, the State capital. The Hudson Valley farms naturally range higher in price than those on the Rensselaer Plateau and Taconic Mountains. Good farm land in the Hudson Valley, where buildings are fairly good and the farm not located on an arterial highway, may be bought at a reasonable price. Most farms in the lowland section have fair locations. Farm lands in better locations, on paved roads, or near centers of population are much higher in price. Although farm land on the Rensselaer Plateau ranges much lower in price, the demand for summer homes has increased the price of the land in recent years.

SOILS AND CROPS[4]

The classification of soils, as established by the Bureau of Chemistry and Soils, is based on the characteristics of the individual soils, particularly those which control or influence crop production. In digging a post hole or examining a bank, layers may be observed in the soil. These layers are called horizons, and, taken as a whole in their relation to each other they are termed the soil profile. The soil profile, together with relief, drainage, or stoniness, represents the general characteristics on which the classification is based and on which the separations in the field are made by the soil surveyor. The three units used in mapping soils are as follows: Series, type, and phase. Of these the series is the most important. It includes soils having the same color, structure, thickness, and arrangement of the soil layers. The soils of the same series have

[4] The soils mapped along the boundaries of Rensselaer County do not everywhere join similar soils in adjoining areas mapped in Vermont, Massachusetts, and New York. The mountain areas of Berkshire County, Mass., which adjoins Rensselaer County on the east, were mapped in semidetail, whereas similar soils in Rensselaer County were mapped in detail. A number of soil separations made in Rensselaer County were not made in Columbia County, on the south, and, vice versa, small areas of several soils mapped in Columbia County were included with other soils in Rensselaer County. These apparent discrepancies are due to further study of the soils and more detailed mapping.

in general the same relief, drainage, and condition of the parent material, and they differ from one another mainly in the texture of the surface soil which in cultivated areas extends to plow depth. The soil series is given a geographic name taken usually from the location in which it was first recognized. For example, Pittsfield, from the city of that name in Massachusetts; Dutchess from Dutchess County, N. Y.; Hoosic from the terraces along Hoosic River. Within the soil series are soil types, the units of soil mapping, defined according to the texture of the upper part of the soil. In this way the type name of the soil—sand, sandy loam, loam, silt loam, or silty clay loam—is derived, and it is added to the series name to complete the name of the soil. For example, Hoosic sandy loam, Hoosic fine sandy loam, Hoosic gravelly sandy loam, and Hoosic silt loam. A phase of a soil is recognized within the type when there is a slight difference, usually of some practical importance but not enough to create a new soil series. Differences in stoniness, relief, or drainage may give rise to the separation of a phase, as Gloucester gravelly loam, stony phase; Hudson fine sandy loam, rolling phase; and Hermon stony loam, shallow phase.

For those interested in the technical relations of the soils in this county, including a description of the profile and soil-forming processes, a section entitled, "Soils and Their Interpretation" is placed in the back of this report.

The soils of Rensselaer County may be classed in the following four groups, based on physiographic, topographic, climatic, and soil differences: (1) Soils of the Hudson Valley and the limestone valley, (2) soils of the stream- and lake-laid terraces, (3) soils of the present flood plains, and (4) soils of the Rensselaer Plateau and Taconic Mountain section.

The soils of the first group are the most important to the agriculture of the county, as this group includes the largest areas of well-drained and arable soils having a wider range in crop adaptability and higher natural productivity under the present system of farming than the soils of any other group. The members of this group are the Cossayuna, Troy, Pittsfield, Stockbridge, Walton, Gloucester, and Dutchess soils, which are well drained; the Albia, Boynton, Culvers, Alps, and Bernardston soils, which are imperfectly drained; the Mansfield soils, which are poorly drained; and the Nassau soils, which are well drained but shallow.

The soils of group 2, soils developed on the terraces, rank next in agricultural importance. They comprise two well-defined subgroups—soils having sandy and gravelly subsoils and soils having clayey subsoils. The soils with sandy and gravelly subsoils include the Hoosic and Copake soils, having smooth surface relief, and the Otisville and Schodack soils, having a broken or kamy surface relief. The soils having clayey subsoils include the Hudson, Orono, and Claverack soils.

The soils of group 3, which include the bottom land, or soils of the flood plains, are the Ondawa and Genesee soils, which are well-drained; the Eel soils, which are imperfectly drained; and the Podunk and Saco soils, which are poorly drained. These soils, although productive, have a limited area and are therefore, as a group, not so important as the upland soils.

The soils of group 4, occurring on the Rensselaer Plateau and in the Taconic Mountain section, are not inherently poor soils, but, as with the New England soils, the high stone content is the limiting factor in determining their use. The soils of this group are the least valuable for farming. The members of the group are the Hermon and Woodbridge soils, which are well drained; the Macomber soils, which are shallow and well drained; phases of the Hermon and Woodbridge soils, which are imperfectly drained; the Whitman soils, which are poorly drained; and the Danby soils, which are loose gravelly kame soils.

Miscellaneous land types, which occur in all parts of the county, include muck, peat, marsh, made land, rock outcrop, and rough stony land, the last two being associated mainly with the soils of the Rensselaer grit plateau and the Taconic Mountains.

In the following pages the soils of Rensselaer County are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Rensselaer County, N. Y.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Cossayuna gravelly loam	16,128	3.9	Hudson fine sandy loam, rolling phase	832	0.2
Cossayuna gravelly loam, deep phase	17,728	4.3	Hudson fine sandy loam, broken phase	1,088	.3
Troy gravelly loam	7,488	1.8	Hudson silty clay loam	6,272	1.5
Troy gravelly loam, sandy phase	768	.2	Hudson silty clay loam, broken phase	8,064	1.9
Albia gravelly loam	19,584	4.7	Orono silt loam	3,840	.9
Albia gravelly loam, broken phase	192	.1	Orono silt loam, dark-colored phase	640	.1
Boynton gravelly silt loam	18,880	4.5	Genesee loam	1,728	.4
Stockbridge loam	4,672	1.1	Genesee fine sandy loam	1,728	.4
Pittsfield stony loam	576	.1	Ondawa loam	5,632	1.4
Pittsfield stony loam, shallow phase	1,792	.4	Ondawa fine sandy loam	1,408	.3
Bernardston loam	7,744	1.9	Ondawa fine sandy loam, high-bottom phase	896	.2
Gloucester gravelly loam	4,224	1.0	Eel silt loam	1,088	.3
Gloucester gravelly loam, stony phase	5,632	1.4	Eel silt loam, low phase	384	.1
Walton gravelly loam	6,208	1.5	Podunk silt loam	3,200	.7
Culvers gravelly loam	8,192	2.0	Saco *silt* loam	4,928	1.2
Alps gravelly silt loam	4,032	1.0	Alluvial soils, undifferentiated	12,480	3.0
Dutchess gravelly loam	11,776	2.8	Hermon loam	5,248	1.3
Dutchess gravelly loam, shallow phase	2,176	.5	Hermon stony loam	21,440	5.1
Dutchess slate loam	6,080	1.5	Hermon stony loam, shallow phase	3,968	1.0
Dutchess slate loam, stony phase	512	.1	Hermon stony loam, imperfectly drained phase	4,736	1.1
Nassau shale loam	30,400	7.3	Woodbridge gravelly loam	7,168	1.7
Nassau shale loam, stony phase	2,176	.5	Woodbridge gravelly loam, heavy-subsoil phase	2,688	.7
Mansfield *silty* clay loam	3,456	.8	Woodbridge stony loam	7,872	1.9
Hoosic gravelly loam	11,712	2.8	Woodbridge stony loam, heavy-subsoil phase	1,600	.4
Hoosic silt loam	192	.1	Macomber slate loam	2,240	.5
Hoosic gravelly fine sandy loam	5,248	1.3	Macomber slate loam, shallow phase	960	.2
Hoosic fine sandy loam	2,112	.5	Danby gravelly sandy loam	1,216	.3
Hoosic fine sandy loam, deep phase	2,368	.5	Whitman stony loam	3,712	.9
Hoosic gravelly sandy loam	4,224	1.0	Muck	6,144	1.5
Hoosic gravelly sandy loam, broken phase	2,560	.6	Peat	2,944	.7
Hoosic loamy fine sand	2,304	.5	Marsh	64	.1
Copake gravelly loam	3,136	.7	Made land	2,368	.5
Copake gravelly loam, broken phase	192	.1	Rough stony land	43,840	10.5
Copake fine sandy loam	3,264	.8	Rock outcrop	2,624	.6
Schodack gravelly fine sandy loam	4,992	1.2	Total	416,640	
Schodack gravelly loam	2,944	.7			
Otisville gravelly sandy loam	4,608	1.1			
Claverack fine sandy loam	4,032	1.0			
Hudson silt loam	6,528	1.6			
Hudson fine sandy loam	768	.2			

SOILS OF THE HUDSON VALLEY AND THE LIMESTONE VALLEY

It is mainly on the soils of the lowlands, or Hudson Valley, that crops which support dairying are grown—principally timothy and clover hay, corn for silage, oats, and alfalfa. Where not eroded these soils are fairly well suited to grasses and clover, and they produce fair yields of the other crops in places where manure is used. Even the imperfectly drained upland soils of this group are well suited to grasses and clover. Only the shallow soils are of low agricultural value, although those derived mainly from limestone are excellent soils for grasses and produce a luxuriant bluegrass sod. The grass cover on most of the shallow soils contains much poverty grass and mouse-ear. Most of these soils contain a fair amount of free lime in the subsoil or substratum, and the additional lime needed in crop production is comparatively small. The structure of the soils is such that they are fairly retentive of moisture.

The Cossayuna soils, although not the strongest upland soils, support a type of agriculture that is fairly representative of this general region. These soils, naturally suited to grass and clover, are adapted to livestock production which, owing to favorable markets for dairy products, has taken the form of dairying. These soils are also used for market-garden crops, owing mainly to market demands, but other soils in the county are better adapted to the production of vegetables. They are used for orcharding to some extent and are fairly well adapted to the production of fruit but are not used for this purpose so much as the soils in other parts of the Hudson Valley.

The Troy and Albia are closely related soils well suited to grass and clover but not so well suited to alfalfa, potatoes, or tilled crops as the Cossayuna soils, owing to compactness of the subsoil and to danger from erosion which is aggravated both by the compact substratum and the generally stronger surface relief.

The Boynton and Alps soils have compact subsoils and substrata and a smooth relief, a combination which retards drainage. Both have highly alkaline substrata. Both are excellent soils for grass but, owing to their compact subsoils, are not used for deep-rooted crops. The soils of the Culvers series are similar but are acid throughout.

The Pittsfield and Stockbridge are the strongest soils of this group, but they are of small extent. They occur in the back valleys, and, although they are capable of producing and actually do produce good crops of timothy and clover hay, corn, oats, buckwheat, and alfalfa, with a minimum of fertilization, they are not sufficiently extensive to influence the agriculture of the county. These soils are high in lime and in many places may be sweet, even to the surface. They maintain excellent pasture, in which bluegrass and bentgrass predominate, and in this respect are superior to any of the upland soils.

The Gloucester and Walton soils have less compact and looser substrata than most of the soils mentioned. They have smooth or undulating surface relief and are well drained. Although not particularly fertile, they have excellent structure and are rated as the best soils for potatoes in the county. As grassland they are much inferior to the Pittsfield and Stockbridge soils, and they are also

inferior for legumes, as they require considerable lime for even mediocre success with these crops. For the production of intertilled and fertilized crops, these soils rank well, although both are of small extent. They occur mainly around the base of the Rensselaer Plateau and are influenced by the rock formations of this section, which are hard enough to resist weathering. Numerous boulders occur over the surface and embedded in the soil mass, and this feature detracts from the value of the more stony areas.

The Dutchess and Bernardston are medium-shallow soils derived from schist and slate. They have smooth surface relief. The Dutchess soils, although comparatively free from stone, may include some outcrops of bedrock, but the Bernardston soils are derived from deeper till. Both are highly acid. These soils, besides being used for the production of hay, are utilized for growing oats, buckwheat, and potatoes.

The Nassau soils are shallow and are used mostly for pasture which is rather poor, as it consists mainly of poverty grass. Most of this soil was under cultivation at one time and has been reduced to its present state largely by erosion. It includes the largest proportion of abandoned farm land in the county.

The Mansfield are low poorly drained soils and where cleared are used for pasture which contains much fescue, native coarse grasses, rushes, and sedges.

Cossayuna gravelly loam.—Cossayuna gravelly loam, together with its deep phase, although not rating as the best agricultural soil in the county, is a good soil and, owing to its extensive area, is one of the most important. It is widespread over the Hudson Valley, or lowlands, but the larger and more typical areas are in the northwestern quarter of the county. The largest area is in the low smooth hill section between the Hoosic River Valley and the Washington County line.

Cossayuna gravelly loam, where cultivated, has a brown mellow loam surface soil which contains much rounded quartz gravel and small platy pieces of slate, larger flaggy pieces of calcareous sandstone and limestone, and a small quantity of sandstone, quartz, and erratic boulders. The surface soil ranges from 8 to 12 inches in thickness, and it is underlain by yellow firm but friable loam which, at a depth ranging from 24 to 30 inches, rests on yellow or greenish-yellow fairly compact raw till filled with blue slate chips. This material extends to bedrock consisting of shale or slate, which lies at a depth ranging from 2 to 6 feet below the surface, with an average depth between 3 and 4 feet. In some small areas, soft partly weathered shale outcrops, but such areas are comparatively unimportant.

The surface relief is smoothly undulating or gently rolling, and the land has a somewhat billowy appearance when viewed from a distance. In many places this soil occurs on a long narrow or oblong low ridge, the axis of which extends north and south. Drainage is well established but not excessive. Most areas of this soil are acid in reaction. The substratum in many places is alkaline or neutral, but in few places does it effervesce with hydrochloric acid.

This is an important agricultural soil and is used for the production of crops fed to dairy cows and to less extent for orcharding

and market gardening. Most of the land is cleared. The remaining forest growth is mainly in small wood lots, in which white, red, and chestnut oaks, hickory, white pine, red pine, ash, hard maple, and aspen predominate. The original surface soil is probably better preserved than that of any of the upland soils in the Hudson lowland section.

The leading crops are timothy and clover hay, some alfalfa hay, corn for silage, and oats. Rye and buckwheat are grown on a small acreage. Potatoes are grown on a larger acreage than any of the other market-garden crops, sweet corn ranks next, and the rest are grown on a comparatively small acreage.

Yields are fairly good under the prevalent cropping system. Corn for silage yields from 8 to 10 tons an acre, wheat 12 to 20 bushels, buckwheat 18 to 25 bushels, and oats 20 to 40 bushels, sometimes higher, according to fertilization. Alfalfa yields from 1½ to 2½ tons an acre and potatoes from 100 to 150 bushels, ranging about 50 bushels higher with added fertilization. Oats are grown on some farms with little preparation of the land. Buckwheat also is often sown with little preparation, and it returns lower yields than would normally be expected on this land. Yields of all crops are somewhat lower than on the deep phase of this soil, which is equal in production to any upland soil in the county. The water-storage capacity of this soil is not so great as in the deeper soil, and for this reason, in dry seasons, crops suffer from lack of moisture more quickly than on the deep phase.

A fair acreage is in pasture which contains much bluegrass, bent grass, and fescue, although many worn-out fields contain much poverty grass. Blue devil, or blue thistle, is a common pest on this land.

Cossayuna gravelly loam, deep phase.—The deep phase of Cossayuna gravelly loam is similar to the typical soil in all respects except the depth of the deposit from which the soil is derived. In the deep phase, bedrock lies at a depth ranging from 6 to 20 feet, the average depth being 12 feet. Most of this deep soil occurs on the higher hills, but many of these hills are not so high as some of the hills of adjacent soils. Most of the hills occupied by this deep soil have a rock core of slate, but the mantle of material is thick enough to completely hide the bedrock.

Cossayuna gravelly loam, deep phase, occupies a slightly larger area than the typical soil and is agriculturally more important. Most of it is cleared and used for the same crops as the typical soil, but yields are slightly larger, as the moisture-holding capacity is somewhat greater. Hay yields about one-half ton an acre more than on the typical soil, and silage corn, the only corn grown to any extent on this land, produces from 2 to 3 tons more. A slightly larger acreage is devoted to alfalfa than of the typical soil, and the proportion of mowing land to pasture land is greater.

Soil of the deep phase is associated with the typical Cossayuna soil and is well distributed over the Hudson lowlands in comparatively small isolated areas or in larger irregular-shaped areas. Most of this deep soil occurs in the western part of the county between Tomhannock, Troy, and Poestenkill.

Most of the bearing orchards are old, and few new ones are being planted.

In the vicinities of Snyders Lake, Luther, and Best, the substratum, below a depth ranging from 24 to 30 inches, is alkaline, and in most places the soil material, below a depth of 3 or 4 feet, effervesces with hydrochloric acid. These areas are better suited to alfalfa than most of this soil and probably are a little more productive for other crops.

Troy gravelly loam.—Troy gravelly loam occupies the high smoothly rounded hills which are irregularly scattered along the outer, or western, edge of the Hudson Valley. These hills are symmetrically oval in outline. They range from one-half to three-fourths mile in width and are about 1 mile long, with the axes extending north and south.

To plow depth, Troy gravelly loam consists of medium-brown or light-brown gravelly loam containing much rounded quartz, sandstone, and some limestone gravel. The gravel range from 1 inch to several inches in diameter, and there are a few rounded boulders 1 foot in diameter. This material rests on firm but friable yellowish-brown gravelly loam having a single-grain structure, which extends to a depth ranging from 20 to 24 inches, where it passes into yellowish-brown or yellow fairly compact but friable partly weathered till. Below a depth ranging from 36 to 40 inches, the material is yellow tightly compact gritty till which breaks into irregular platy fragments having rather dark iron or organic coatings along the cleavage lines in places. The soil is acid above a depth of 36 inches and is inclined to be alkaline below this depth.

Drainage, owing to the surface relief, is good, notwithstanding the compact substratum. No appreciable mottling occurs above the compact parent till material as in the Albia soils.

This soil has suffered from sheet erosion where poorly managed, and the present surface soil is largely developed from the subsoil of the original, or virgin, soil.

Troy gravelly loam, together with its sandy phase, occupies 12.9 square miles and is an agriculturally important soil, as it is practically all cleared and used for farming. Its use is determined to a great extent by its surface relief. Most of the soil is used as mowing land which is later pastured, and a comparatively small area is cultivated, mainly to silage corn and oats. Yields in general are not so high as on Cossayuna gravelly loam, partly because the land has not been so well managed. Timothy and clover hay, the leading crop, does fairly well and yields from 1 to 1¼ tons an acre. This soil is used to a very small extent for alfalfa, but red clover does well and is used in mowings with timothy. This soil, in common with many others in this section, when worn out, is used for pasture, with a cover containing much poverty grass. Before it reaches the worn-out stage, however, it contains some bluegrass and much bent grass.

Troy gravelly loam, sandy phase.—Troy gravelly loam, sandy phase, is essentially the same as the typical soil, except that the surface soil contains both outwash sand and gravel and in places wind-blown sand. Soil of this phase is fairly important agriculturally, in that it is used for cultivated crops to a greater extent than the typical soil. Crop yields are about the same as on the typical soil.

Albia gravelly loam.—Albia gravelly loam occurs on well-defined rounded hills or drumlins in the western half of the county and to some extent in the northern part. It occupies slightly smoother and rather less steeply sloping hills than Troy gravelly loam.

To a depth of 7 or 8 inches the surface soil is light-brown mellow gravelly loam. It is underlain by yellowish-brown firm but friable gravelly loam which extends to a depth of 18 or 20 inches, where it passes into a 4- to 6-inch layer of pale-yellow or greenish-yellow, faintly mottled with gray and brown, slightly compact material. This rests on greenish-yellow tightly compact gritty till, strongly mottled with gray, which extends to a depth of 10 feet or deeper. In most places the lower substratum is alkaline, but the surface soil and the subsoil, above a depth of 24 inches, are acid. The gravel consists of rounded pieces of quartz, sandstone, and some limestone, together with many shale fragments.

Drainage is not so good in this soil as in Troy gravelly loam, owing to the slightly denser or more compact substratum, which in general contains less gravel, and to the slightly lower hills or drumlins. Many of the poorly managed sloping fields have suffered severely from surface, or sheet, erosion and in places are gullied, but the severely gullied areas are classed as a broken phase.

Albia gravelly loam is extensively developed on isolated or multiple hills throughout the Hudson lowlands. Its total area is 30.6 square miles. Nearly all the land is cleared and is used for mowing and pasture, with a small area in cultivated crops, such as corn, oats, and buckwheat. Many "run-out" mowings are used for pasture, but the area in permanent pasture is small. The pasture land contains much bentgrass and poverty grass, the amount depending on the degree of soil depletion. Hay yields range between wide limits, from ¾ ton to 1½ tons, with an average of about 1¼ tons an acre where any care is taken of the land. Corn and small-grain crops yield slightly less than on Cossayuna gravelly loam. At one time Albia gravelly loam was utilized for mowings more than at present, and the land was kept in better production.

Small areas in the northeastern part of the county have a silt loam surface soil which is comparatively gravel free but contains some quartz gravel. These areas are used for about the same crops as the more typical areas. Associated small areas, having boulders on the surface and embedded in the soil material, are indicated by stone symbols on the soil map. They are utilized for pasture. The silty and stony areas have suffered less from erosion than the rest of the soil.

Albia gravelly loam, broken phase.—The broken phase of Albia gravelly loam is of small extent. It occupies the steep sides of drumlins and hills where erosion and earth slides have been active. In most places the surface soil between the gullies does not differ widely from the typical soil. Many of the gullies are from 3 to 6 feet deep and are of about the same width at the top. Soil of the broken phase is of little value except as pasture and, aside from the actual gullies, has about the same value for pasture as the typical soil.

Boynton gravelly silt loam.—Boynton gravelly silt loam is closely associated with Albia gravelly loam, in many places occupying the

smoother parts of the same hill or drumlin. It occurs in large areas in the northern part of the county in the towns of Pittstown and Hoosic.

The surface soil, to a depth of 4 or 6 inches, is dark-brown gravelly silt loam having a granular structure caused by an accumulation of organic matter. This material passes into yellowish-brown firm heavy silt loam which rests, at a depth of 12 or 15 inches, on bluish-gray, mottled with brown, compact silty clay loam having a neutral reaction. This material grades, below a depth of 36 inches, into bluish-gray compact calcareous till. The entire soil mass contains much fragmentary blue slate and some quartz gravel.

The surface is gently sloping, and surface drainage is fair, but, because of the compact substratum, underdrainage is retarded to the extent that the soil is imperfectly drained.

Nearly all the land is cleared of the original hardwood growth and is utilized for crops essential to dairying. Hay (timothy, redtop, and clover) is the leading crop. The run-out mowings that are used for pasture support much bentgrass. The principal cultivated crops are oats and buckwheat.

This is a fairly productive soil, and, when the land is handled properly, hay yields from 1 to 1½ tons an acre, oats from 30 to 45 bushels, and buckwheat from 15 to 25 bushels. Buckwheat is usually grown without fertilizer. This is a good soil for grasses and is fairly well suited to alsike clover, but it is not well suited to and is not used for alfalfa or any deeply rooted crop. Orcharding is not developed, but some small fruits are grown. The wood lots include ash, hickory, red oak, and hard maple, and there are many butternut trees scattered over the soil. Wild carrot and orange hawkweed are the principal weed pests in the meadows.

Stockbridge loam.—Stockbridge loam occurs in the back valley, or longitudinal valley, known in its various parts as Stephentown Valley, Berlin Valley, and Hoosic Valley. Although one of the most productive soils in the county, it is not highly important agriculturally, owing to its small total area.

This soil is dark-brown mellow loam to a depth of about 7 inches. This material passes into brown friable loam which changes, at a depth ranging from 15 to 20 inches, to grayish-brown fairly compact but friable loam. This, in turn, changes, at a depth of 24 inches, to greenish-gray tightly compact gritty loam which extends to a depth of 5 feet, below which it passes into greenish-gray compact till containing streaks of partly disintegrated limestone. The upper part of this soil is acid, but the subsoil is alkaline, and the substratum is highly calcareous. In places, limestone boulders are present throughout the soil mass.

The land is cleared and used principally for hay (timothy and clover) and pasture. The pasture land supports a growth of bentgrass, sweet vernal, bluegrass, and much brushy cinquefoil (*Potentilla fruticosa*). Such crops as corn, oats, and buckwheat are grown successfully on a small acreage, and yields are usually good. This soil is not so well farmed here as it is in adjacent counties, but its natural productiveness is as good as that of any other soil in Rensselaer County. Acre yields of timothy and clover hay range from 1 to 2 tons, corn (for grain) from 30 to 65 bushels, silage corn

from 10 to 18 tons, buckwheat from 20 to 35 bushels, and oats from 40 to 50 bushels. Only small quantities of fertilizer are used on this land, but applications of ground limestone and manure (when used) are heavy.

Pittsfield stony loam.—Pittsfield stony loam, although small in total area, is one of the important soils for pasture. It occurs mainly in the Hoosic Valley in one of the best farming sections.

The surface soil, to a depth of 6 or 8 inches, is dark-brown mellow loam resting on snuff-brown mellow loam which passes, at a depth of 10 or 12 inches, into brown, reddish-brown, or yellow-brown friable loam. At a depth of 24 inches the subsoil rests on firm pale yellowish-brown loam which passes, at a depth ranging from 32 to 36 inches, into greenish-gray slightly compact highly calcareous raw till. The entire soil mass contains slate fragments, numerous boulders of limestone, and some outcrops of the limestone bedrock. The surface soil ranges from acid to neutral, the subsoil is alkaline, and the substratum is highly calcareous. The surface relief ranges from undulating and rolling to hilly, and drainage is well established.

This soil is used for mowing and pasture and to a very small extent for crop production. Acre yields of timothy and clover hay range from 1½ to 2½ tons and of alfalfa from 2 to 3½ tons. Yields of the cultivated crops—corn, oats, buckwheat, and potatoes—are good. Little fertilizer or lime is used on this land. Bluegrass, Dutch clover, and bentgrass are dominant in the pastures, and brushy cinquefoil is the main weed pest. The remaining small wood lots include red oak, hard maple, and butternut.

Pittsfield stony loam, shallow phase.—The shallow phase of Pittsfield stony loam has a mellow brown loam surface soil resting on limestone bedrock at a depth of less than 12 inches. This soil occupies hilly country and is used almost exclusively for pasture, for which it is the equal or superior of any soil in the county. Its high content of lime at a comparatively slight depth shows that the soil is comparatively young and not leached of plant nutrients. Bluegrass, clover, and bentgrass are the principal grasses and, as on other soils derived from limestone, shrubby cinquefoil is the chief pest in the pastures.

Soil of this phase is associated with the typical soil in the back valley and in scattered areas over the Hudson lowland. It is not extensive but is considered, by most farmers, good pasture land. The stone content is the principal drawback to its use for cultivated crops.

Bernardston loam.—Bernardston loam occurs in the back valley that lies between the Rensselaer Plateau and the Taconic Mountains, on gently sloping hills and benches along the base of the mountains. This soil, to a depth of 6 or 8 inches, is dark-brown mellow loam. It is underlain by yellowish-brown or pale yellowish-brown firm but friable loam which passes, at a depth ranging from 12 to 15 inches, into yellow or pale-yellow compact loam. Below a depth ranging from 24 to 30 inches, the substratum material is compact greenish-gray or bluish-gray till. The entire soil mass contains many blue slate fragments and some quartz gravel. This is an acid soil and does not become noticeably alkaline even in the substratum.

Most of the land is cleared of the original timber and is used for mowing and pasture. Some abandoned land lies at the heads of

the hollows. The present forest, which is second growth, includes red oak, beech, gray birch, and white birch trees. The pastures contain much steeplebush (*Spiraea*) and vaccinium, together with sweet vernal and poverty grass, and a small amount of bentgrass. Mowings consist of timothy, redtop, clover, and some orchard grass. Oats, buckwheat, rye, corn, and potatoes are the leading cultivated crops, and yields are fairly good when an effort is made to keep the soil in good condition by the use of lime and manure. Hay yields as well as on any of the soils—from 1½ to 2 tons an acre—but many meadows are allowed to run for many years without reseeding and the average yield is much lower. Oats yield from 30 to 50 bushels, depending on the fertilization, and buckwheat from 25 to 30 bushels where fertilized and from 15 to 20 bushels on unfertilized land. Very little commercial fertilizer is used on this land, but where dairying is followed, as on most farms, both lime and manure are used. Small quantities of commercial fertilizer, about 200 pounds an acre, are used with small grains.

A number of small areas of this soil lying near the base of the mountains have a noticeable quantity of quartz gravel on the surface, and there are larger areas in the same position which contain an appreciable quantity of stone, ranging from small pieces of schist to large boulders of quartzite. The stony areas are not so valuable for cultivation and are in forest or used for pasture.

Gloucester gravelly loam.—Gloucester gravelly loam occurs in comparatively small areas scattered around the base of the Rensselaer Plateau, mainly around the southern end, where it occupies low gently sloping smooth hills. The surface soil is brown mellow fine sandy loam or loam, passing, at a depth of 6 inches, into yellowish-brown firm but friable loam. At a depth ranging from 15 to 20 inches, this changes to pale yellowish-brown material of sandier texture. Below a depth ranging from 30 to 36 inches, is the substratum of gray gritty till which is firm in place but not compact. This condition of the substratum allows good internal drainage.

Gloucester gravelly loam is derived mainly from the Rensselaer grit formation, and, owing to the hardness of this stone, even the nonstony areas contain a noticeable quantity of rounded and angular boulders. Much gravel from the grit formation occurs on the surface and throughout the entire soil mass. Small areas of this soil are influenced by the red shales outcropping in this vicinity, to the extent that the surface soil and subsoil have a somewhat red cast, the surface soil contains more silt, and the substratum, or parent material, contains thin bands of somewhat red silty material interbedded with the sandier till.

Most of this land is cleared and used for the crops generally grown, but yields are mediocre for all crops except potatoes which are grown successfully on a commercial scale in Stephentown Valley. Applications of fertilizers, at a rate ranging from 600 to 1,000 pounds an acre are used for potatoes, and yields range from 150 to 250 bushels an acre.

Gloucester gravelly loam, stony phase.—Gloucester gravelly loam, stony phase, has a profile similar to that of the typical soil, except that the stony soil, as the name implies, contains a quantity of boulders derived mainly from the Rensselaer grit formation. Where the land has been cleared, much of the loose stone has been

removed and piled into stone fences. A large proportion of this soil is in forest consisting of second-growth white pine, white and red oaks, white and brown birches, aspen, and hard maple. Most of the cleared land is in pasture which supports a growth of bentgrass, sweet vernal, and poverty grass, together with much sweetfern and *Spiraea*. The Gloucester soils here are not quite so productive as these soils in eastern New England.

Walton gravelly loam.—The 7-inch surface soil of Walton gravelly loam consists of brown or light-brown mellow silt loam or loam, containing some gravel of quartz, "grit" sandstone, and red shale fragments. This layer is underlain by the subsoil of yellowish-brown firm but friable silt loam or loam, which, at a depth ranging from 20 to 24 inches, passes into red or reddish-brown firm but friable gritty loam. At a depth ranging from 36 to 60 inches, this material, in turn, rests on rather compact reddish-brown gritty till. The soil throughout the entire profile is acid, except in a few places where the material in the lower subsoil layer is neutral and the substratum is alkaline.

Walton gravelly loam is not extensive. It occurs in small irregular-shaped areas in a belt lying west of the base of the Rensselaer Plateau, from the vicinity of Poestenkill southward to the Columbia County line. This soil occupies smoothly rolling hills that lie from 700 to 800 feet above sea level and from 100 to 200 feet above the adjacent terraces and bottoms. Drainage is well established.

Practically all of this soil has been under cultivation at some time. Some areas support a cover of second-growth white oak, red oak, brown birch, gray birch, and aspen, but most of the land is used for mowing and pasture. The mowings include timothy, clover, and redtop. The pastures contain some bentgrass and much poverty grass. A small acreage is used for such crops as silage corn, oats, rye, buckwheat, and some potatoes, and yields of all the crops grown, including grass and clover, range from fair to good.

Culvers gravelly loam.—Culvers gravelly loam has somewhat the same profile as Walton gravelly loam, with the exception that the substratum is very compact at a depth ranging from 20 to 24 inches and a mottled zone several inches thick occurs just above the compact layer. Moisture passes along the top of the compact layer and in places causes seepage along the lower slopes. This soil occurs in similar topographic positions to those occupied by Walton gravelly loam. It contains more stones (largely Rensselaer grit) than the Walton soil, as the stones have not been removed so thoroughly.

Much of the land is in forest, and the cleared areas are used for mowing or pastures. The forest includes white pine, hard maple, gray birch, hazelnut, and alder. The mowing is mainly timothy and redtop but includes many weeds. The pastures contain much poverty grass and bentgrass. Yields of all crops except grass are low.

Alps gravelly silt loam.—Alps gravelly silt loam occurs within a narrow belt around the western base of the Rensselaer Plateau in small irregular-shaped areas. This soil is characterized by its heavy granular chocolate-brown surface soil and very compact heavy subsoil and substratum, both of which are reddish brown and contain some gray mottling. This soil is much like Boynton gravelly silt loam in all characteristics except color. It has the same struc-

ture and consistence. The subsoil is alkaline, and the substratum is highly calcareous. The entire soil mass, especially the substratum, contains numerous small chips of red slate and very little gravel or stone. The tightness of the substratum prevents the downward movement of moisture and, even though the surface relief is smooth or gently sloping, surface erosion is active and in many places has advanced to the gully stage.

The total area of this soil is not large, and the soil is not agriculturally important, as much of it has been withdrawn from cultivation. It is a well-recognized fact that this soil is difficult to handle, especially for cultivated crops. Most areas which were formerly in mowing are now in pasture. The pastures contain much poverty grass, lady's-tobacco (*Antennaria*), hardhack (*Spiraea tomentosa*), alder, and thorn apple. The small area in mowing, mainly redtop grass, contains little clover and many weeds, and it furnishes low-grade hay. In the few places where the land is well farmed it seems productive and compares well with Boynton gravelly silt loam. About 60 percent of this soil is clear of the original forest and is now growing up to white pine.

The associated stony areas are for the most part in forest, and the small cleared areas are in pasture. The stony land has a lower agricultural value than the rest of the soil, but it has not suffered from erosion to the extent that the nonstony areas have. The tree growth on the more stony land is largely hardwoods and white pine.

Dutchess gravelly loam.—Dutchess gravelly loam lies mainly in the northeastern quarter of the county, although small scattered areas occur in other sections on smoothly sloping hills. The 6-inch surface layer is brown mellow loam or silt loam, containing much quartz gravel. It grades into yellowish-brown firm but mellow loam which changes to pale-yellow loam at a depth ranging from 15 to 20 inches. Below this depth the subsoil consists of firm but not compact greenish-yellow loam which passes, at a depth ranging from 24 to 30 inches, into fairly but not tightly compact greenish-gray or bluish-gray gritty till of a loam texture, extending to a depth ranging from 10 to 12 feet. The entire soil mass contains quartz gravel and slate chips. Several areas associated with this soil are comparatively gravel free, but even these contain some gravel and many slate fragments. Some stony areas, which have a much lower value for agriculture, are pastured or in forest. The forest growth consists of red oak, chestnut oak, white pine, hard maple, and gray birch.

Dutchess gravelly loam, in common with all the Dutchess soils, is acid throughout. This soil, although not extensive, is used for farming and is of some agricultural importance. The crops grown are timothy, redtop, and clover hay, oats, buckwheat, and potatoes. The yields of these crops, where fertilized with moderate quantities of commercial fertilizer, manure, and lime, are fairly good. Although grasses are not so well suited to this soil as to the soils derived from or influenced by limestone, the pastures contain some bluegrass, much bentgrass, and white clover. This soil is not quite so strong as Bernardston loam, but it is a good soil on which to grow cultivated crops when much of the fertility is supplied by fertilizers and manures.

A noticeable feature about the back-valley section is that all the soils are not so depleted as those of the Hudson Valley lowland belt proper. This is probably because the soils have not been used so extensively nor so long for cultivated crops and possibly because they do not erode so easily as some soils of the lowland belt.

Acre yields of hay range from one-half ton to 1½ tons, according to condition and age of meadows; corn, from 20 to 35 bushels; oats, from 30 to 45 bushels; potatoes, from 100 to 150 bushels, and higher when fertilized; and buckwheat, from 15 to 25 bushels.

Dutchess gravelly loam, shallow phase.—The shallow phase of Dutchess gravelly loam is similar to the typical soil, except in depth to bedrock of soft slate or shale, which in general ranges from one-half inch to 24 inches in the shallow phase. In places the bedrock is exposed. Soil of this phase has a much lower value for all crops than the typical soil, although grasses do fairly well.

Dutchess slate loam.—Dutchess slate loam is associated with Dutchess gravelly loam and occupies similar positions. The slate loam differs from the gravelly loam in that it has a high content of slate chips throughout the soil mass, and the depth to bedrock is less. The soil material of Dutchess slate loam ranges from 20 to 30 inches in thickness and rests on slate or shale bedrock. From 30 to 60 percent of this soil consists of shale fragments and some quartz gravel. The soil is partly developed from residual material and partly from glacial material.

Dutchess slate loam is inferior to Dutchess gravelly loam in crop production. It is used for mowings of timothy, redtop, and clover, but it produces slightly lower yields than the gravelly loam. Much of the land is devoted to pasture which is only fair, as it contains much poverty grass, some bentgrass, *Spiraea*, sweetfern, and blueberries. This soil is used to a very small extent for cultivated crops.

Dutchess slate loam, stony phase.—The stony phase of Dutchess slate loam is similar to the typical soil but differs from it mainly in the amount of stone on the surface and in the higher proportion of rock outcrops. This stony soil is used for pasture or is in forest. It occupies a comparatively small acreage and is of little agricultural importance.

Nassau shale loam.—Nassau shale loam is widespread over the entire Hudson Valley and is known locally as shale knolls or shale land. About 50 or 60 percent of the land consists of shale rocks covered by brown partly weathered shale and silty or loamy material extending to a depth ranging from only 3 to 5 inches. Over the rest of the land the soil mantle is in few places more than 1 foot deep. It consists of shale loam containing some gravelly fragments of quartz, sandstone, and a few erratic limestone or other crystalline rocks. A comparatively small proportion of this material is of glacial origin. The bedrock consists almost entirely of yellow or gray soft shale over the western half of the county, but in an irregular belt near the center are areas in which the local rock is red shale, and the surface soil is chocolate brown in color. Where this soil occurs in the eastern part of the county, the bedrock is slate and schist.

According to the early records for this section, these shale knolls were plowed, and the soft shale readily broke down into soil material; but the soft partly rotted material has largely been removed

by erosion, and at present the shale knolls in many places represent hard unweathered shale rock with a very thin covering of soil. Some of the forested areas still have a surface layer ranging from 8 to 15 inches in thickness of the original soil material which has not been affected by erosion. Many residents state that the shale knolls were cultivated at one time and produced satisfactory crops of corn and potatoes.

The surface relief in general is fairly smooth, but in many fields it is variable, owing to the unevenness of the bedrock. Drainage is fairly well established but, judging by the present growth of vegetation, the soil is droughty.

Most of the land is in pasture consisting mainly of poverty grass, lady's tobacco, *Spiraea*, orange hawkweed, and yellow hawkweed. On spots where some soil has accumulated, yields are similar to those on Cossayuna gravelly loam or Dutchess gravelly loam, according to the associated soil, but these spots are rarely used for farming. The grass on these spots is better than on the shallower areas. It includes much bentgrass and in places some Canada bluegrass and less poverty grass. Much chokecherry and panicled dogwood grow in fence rows. The areas of this soil associated with Cossayuna gravelly loam are slightly more productive than those in other parts of the county where the soil is associated with the Dutchess soils.

In places where pasture is scarce, some effort is usually made to maintain the sod growth by reseeding and fertilization, otherwise the soil becomes run down. In general, little care is taken of this soil, and it has a very low agricultural value.

Nassau shale loam, stony phase.—Nassau shale loam, stony phase, is associated with typical Nassau shale loam, mainly in the eastern part of the county, and it differs from the typical soil in that it has more exposed rib rock or outcrops and is in general steeper.

Probably all this land was used at one time for pasture, but the poverty grass pastures are being encroached on by white pine. The second-growth forest includes hemlock, red oak, hard maple, hornbeam, alder, witch-hazel, white pine, and basswood. The forested areas have a surface soil, ranging from 8 to 12 inches in thickness, that has been but slightly eroded. The rock outcrop consists mainly of ledges. This stony soil has very low agricultural value.

Mansfield silty clay loam.—Mansfield silty clay loam occupies long narrow depressions throughout the area of till soils in the Hudson Valley. The surface soil is dark-gray granular silty clay loam, about 8 or 10 inches thick, resting on mottled gray, yellowish-brown, and rust-brown firm silty clay loam which becomes gray or bluish-gray rather heavy till below a depth of 20 inches. Some gravel and stone are present, especially in the areas influenced by the grit formation. Drainage is poor. Areas associated with the red till and red shale outcrop have a dark reddish-brown surface soil and a reddish-brown subsoil mottled with gray. Otherwise these areas are similar to the rest of the Mansfield soil. These areas of red soil are utilized for pastures, and there are many thickets of hornbeam, wild plum, soft maple, and Juneberry.

Practically all this soil was cleared and used at one time for mowing, pasture, and crops, but at present it is little used except for pasture, although small areas of timothy and redtop are mowed for hay and still smaller patches of oats are grown. Much of the pasture land has grown up in alder, willow, gray birch, brown birch, and soft maple, together with *Spiraea*, ferns, and rushes in many places. Where the land is well cared for, it furnishes good grazing. Crop production, especially of oats, is good in places where the drainage ditches are kept open.

SOILS OF THE STREAM- AND LAKE-LAID TERRACES

The soils developed on the terrace areas may be divided into three groups as follows: Soils on smooth terraces having a gravel substratum, soils having a clayey substratum, and soils having a gravelly substratum and a hummocky surface relief.

The first group—the smooth soils with a gravel substratum—includes the Hoosic and Copake soils. These soils are widespread over the Hudson Valley lowlands and occur in the largest areas near the Hoosic River trough, in a belt between the clayey deposits of old Lake Albany and the western escarpment of the Hudson lowland and extending along the hanging valleys of the lowlands. These soils as a rule have light-textured surface soils—sandy loams or loams—with loose gravelly subsoils. They are used for the production of practically all the crops grown in the county but are not so extensively used for mowing and pasture as the upland soils, because they are not naturally so well suited to grass. These soils are not naturally productive, especially the sandier members, but they all have a structure which makes them suited to crop production when plant nutrients are supplied. They are fairly free from stones and can be cultivated easily with modern machinery. Many market-garden crops, small fruits, orchard fruits, and alfalfa are grown on these soils.

The areas having a gravel substratum and a hummocky surface relief—the Schodack and Otisville soils—are less valuable for crops than the smoother soils. They are more droughty because of excessive drainage. The Copake and Schodack soils are more valuable for alfalfa than the Hoosic and Otisville soils, owing to the fact that they contain free lime in the substratum, at a depth ranging from 5 to 8 feet below the surface, whereas the other soils having a gravelly substratum are acid throughout.

The soils of the terraces having a clayey substratum—the Hudson, Claverack, and Orono soils—are naturally fertile, but the consistence of the heavier members is such that they remain cold late in the spring and are in general more difficult to handle. The substratum contains free lime, and this adds to the value of these soils for leguminous crops. They are well suited to small grains and are used for such crops as oats, wheat, rye, and buckwheat. Grasses do exceptionally well, and the pastures contain much bluegrass. Mowings include considerable timothy and clover, and a fair proportion of these soils is devoted to hay crops. Market gardening, small-fruit growing, and orcharding are developed. The moisture-holding capacity of the soils is excellent. Soils like the Claverack, which have a layer of sandy material over the clay, present almost an ideal con-

dition for holding moisture, and the structure of the surface soil makes tillage easy. For these reasons this is the leading soil for market gardening in the county. The heavier members of the Hudson and the Orono series are better suited to grasses and small grains, which require a minimum of surface tillage. These heavier soils are confined mainly to a narrow belt lying just east of the Hudson River trough, and they occur in smaller areas in the Hoosic River Valley.

Hoosic gravelly loam.—Hoosic gravelly loam is the most extensive Hoosic soil. It occupies smooth level terrace positions in nearly all parts of the county but is more extensive along the Hoosic River terraces and along the western edge of the Hudson Valley lowlands. The 8- to 10-inch surface soil is brown mellow gravelly loam which rests on yellowish-brown firm but friable loam containing some gravel, and this layer, in turn, grades, at a depth ranging from 20 to 24 inches, into yellowish-brown or pale yellowish-brown gravelly loam or gravelly sandy loam, having less consistence than the material above. Below a depth ranging from 30 to 36 inches, the gravel and sand become more loose and open, and below a depth ranging from 60 to 70 inches, the material consists of raw bedded gravel, mainly quartz, yellow shale, and blue slate. The entire soil mass, which is loose and open in structure, is acid in reaction. Owing to the loose and open structure of the substratum this soil is well or excessively drained, although the loam texture of the surface soil gives it a better moisture-holding capacity than the other Hoosic soils. During dry seasons crops suffer from lack of moisture.

The gravel occurring in most of this soil are small slate or shale chips and small rounded quartz gravel 1 or 2 inches in diameter and smaller, but in some areas, noticeably near the base of the Rensselaer Plateau and on certain terrace levels near Hoosic River, the gravel is larger than elsewhere and consists of quartz and sandstone cobbles ranging from 4 to 8 inches in diameter. Around the base of the Rensselaer Plateau, where the terrace soils are influenced by the grit formation, the parent material contains much gravel from this source. The soil here is developed to slightly less depth, that is, the raw sandy and gravelly material lies closer to the surface than is normal for this soil where derived wholly from slates or shales. In the vicinity of Nassau, where red shales predominate, the soil has a definitely red cast throughout.

The smoothness of the surface relief and absence of stones allow the use of tractors, cultivators, and other labor-saving machinery on the farms.

Inherently, Hoosic gravelly loam is not the strongest soil in the county, but, owing to its location, surface relief, texture, and freedom from stone, it is one of the most valuable agricultural soils. It responds readily to fertilizer, manure, and other methods of soil improvement. It is used for mowing and tilled crops, such as corn, oats, potatoes, rye, buckwheat, and vegetables. Many orchards are developed in the town of Schodack. Pasture is confined to old mowings. Market-garden crops are grown on this soil near Troy and in the section near Rensselaer. Alfalfa is not grown successfully, but red clover is grown in all mowings and often grown alone. Many house sites are located on this land as well as on the other Hoosic soils, and the small patches around the homesteads are worked intensively. Crop yields differ considerably, according to the state of

cultivation and the kind and quantity of fertilizer used. Acre yields of potatoes range from 125 to 200 bushels, according to the fertilizer applied; corn, from 6 to 7 tons of silage, ranging as high as 10 tons when fertilized, and from 25 to 45 bushels of grain; oats, from 30 to 50 bushels; and hay, from 1 to 1½ tons on new mowings and less than 1 ton on old mowings. Rye and buckwheat yields are low, as these crops are seldom fertilized. This soil warms up early in the spring and can be cultivated before the heavier or less well drained soils.

Hoosic silt loam.—Hoosic silt loam has a profile similar to that of Hoosic gravelly loam. It differs from that soil mainly in the comparative freedom from gravel in the upper part of the profile. It is associated with the other Hoosic soils and has similar surface relief and drainage conditions. This soil is used, probably, to a greater extent for tilled crops and vegetables than the gravelly loam, and yields are about the same as on the gravelly loam, or slightly better.

In common with the other Hoosic soils, this soil is not particularly well adapted to grasses. Mowings of timothy and clover do fairly well where the land is properly fertilized, but they include much quackgrass and wild carrot. Pastures and run-out mowings are composed principally of bentgrass and poverty grass.

Hoosic gravelly fine sandy loam.—Hoosic gravelly fine sandy loam occurs mainly on the terraces along Hoosic River. Although not so droughty as Hoosic gravelly sandy loam, it is more droughty than the heavier Hoosic soils. Throughout the profile this soil is similar to Hoosic gravelly loam, differing from that soil mainly in texture.

This soil is used for the same crops as Hoosic gravelly loam, but it is used to less extent, although the yields are slightly higher than on the gravelly loam. It is handled in the same manner as the other Hoosic soils along Hoosic River. A number of abandoned fields support a cover of broomsedge and running cinquefoil, and some are growing up with gray birch sprouts, sweetfern, and huckleberry. Most of the pastures contain poverty grass.

Hoosic fine sandy loam.—Hoosic fine sandy loam, like Hoosic silt loam, contains little gravel in the upper part of the profile, and it is like the other Hoosic soils in the substratum. The texture ranges from very fine sandy loam to sandy loam, the fine sandy loam predominating. This soil is used for approximately the same crops as Hoosic gravelly loam, but the yields are slightly lower. It occurs in scattered areas, mainly on the Hoosic River terraces.

Hoosic fine sandy loam, deep phase.—Hoosic fine sandy loam, deep phase, differs from the other Hoosic soils in that the usual gravel substratum is lacking, and the subsoil of fine sandy material passes down into material no coarser than sand, which extends to a depth ranging from 8 to 10 feet, where it rests on the clay beds of the old Lake Albany formation. This deep soil, although well drained, has a better moisture reserve than the other Hoosic soils which are underlain by gravel strata. In places the clay strata may be missing, and the sandy deposits rest on till at about the same relative depth.

This land, besides being used for the crops common to dairying, timothy and clover hay, corn, oats, and potatoes, is used for market-garden crops and orcharding. Yields are equally as good as those

on the silt loam or the gravelly loam and superior to those on the fine sandy loam.

Hoosic gravelly sandy loam.—Hoosic gravelly sandy loam occurs mainly on the terraces adjacent to Hoosic River and in Stephentown Valley. It occupies the older and higher terraces. Drainage is excessive, owing to the looseness of the deposit from which the soil is derived. The soil profile is similar to that of the other gravelly Hoosic soils, but the texture of the sandy particles ranges from coarse to medium. The parent material contains more quartz gravel and coarse sandy material than that of the other Hoosic soils.

Several areas associated with this soil, the largest located north and northwest of Schaghticoke, have a sandy loam texture and contain little gravel in the surface layer, but otherwise the profile is normal.

A considerable area of this soil has been taken out of cultivation and is grown up to birch and aspen sprouts. The cultivated areas are used for much the same crops as are the other Hoosic soils, but yields are lower on this soil. Grasses are not well suited to it, and fallow fields contain much poverty grass, lady's tobacco, broomsedge, and running cinquefoil. Much of this soil is the result of the removal of the fine surface material by wind erosion. Many of these areas have grown up to scrub oak, gray birch, pitch pine, and huckleberry, and other patches are barren or support little vegetation. The soil in other areas, especially those in the back valley or near the base of the grit plateau, is derived from coarser material. These areas have not suffered from erosion and include better soil than the areas of coarser soil on the Hoosic River terraces.

Hoosic gravelly sandy loam is the least productive Hoosic soil in this county. Small areas are included which have little gravel on the surface. Crop yields in general are much lower than on the gravelly loam and somewhat lower than on the gravelly fine sandy loam.

Hoosic gravelly sandy loam, broken phase.—The broken phase of Hoosic gravelly sandy loam occupies the broken edges of areas of all the Hoosic soils and ranges in texture from fine loamy sand to coarse sandy loam. In most places there is considerable gravel. Soil of this phase is too steep for agricultural use except as pasture. Most of it is covered with forest and should be allowed to remain in this use.

Hoosic loamy fine sand.—Hoosic loamy fine sand occupies the somewhat high terraces in the northwestern corner of the county. It differs from other Hoosic soils in that it has no gravel in the entire soil mass, but otherwise it is similar to them. Like other Hoosic soils, it is acid in reaction throughout. This soil is used for about the same crops as the other Hoosic soils, but yields are low—only slightly higher than those obtained on Hoosic gravelly sandy loam.

The rolling areas of this soil represent wind-blown dunes and more or less billowy areas where a soil profile has developed, and a few spots consist of dune sand. This land has a low agricultural value. Most of the more rolling areas are in sod consisting of crabgrass and quackgrass, and there are a few gray birch, brown birch, and aspen trees.

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Copake gravelly loam.—The Copake soils are similar to the Hoosic soils, with the exception that the substratum of the Copake soils, at a depth ranging from 6 to 8 feet below the surface, contains a considerable amount of carbonates. This fact is significant in the production of one crop, alfalfa, as the alfalfa roots reach down to the calcareous material. Copake gravelly loam is associated with the Hoosic soils in places, but most of it occurs on the terraces along the western edge of the Hudson Valley between Troy and Moordener Kill, where it occupies high smooth well-drained areas. Small areas lie along Walloomsac River in the northeastern part of the county.

The surface soil is brown granular mellow loam containing a noticeable quantity of quartz gravel. It passes, at a depth of 8 or 10 inches, into yellowish-brown or reddish-brown firm but friable loam containing little gravel in most places. At a depth ranging from 20 to 24 inches this material is underlain by yellowish-brown or brown gravelly sandy loam which is only slightly firm and changes at a depth of about 36 inches into loose and open mixed gravel and sand of slate and quartz. In most places, at a depth of 60 inches, the material is mildly cemented and contains many partly rotted limestone gravel. Below a depth ranging from 5 to 6 feet is a bed of gravel coated with carbonates. The depth to alkaline material is variable. In most places the surface soil and subsoil are acid to a depth ranging from 20 to 24 inches, and in some places the material is acid to a depth of 48 inches. Below this depth the material is generally alkaline, but in few places does it contain free lime within a depth of 6 feet below the surface, and in many places lime is present to a depth ranging from 8 to 10 feet. In places below a depth of 5 or 6 feet the substratum contains much gray limestone material, but in other places the gravel are merely lime coated.

Some areas on the high terraces, associated with the Schodack soils, have an undulating surface relief, but these areas are not so well suited to farming as the rest of the land.

Copake gravelly loam is used for the same crops as Hoosic gravelly loam and is about equally productive. In places it is better farmed than the Hoosic soils. As already stated, Copake gravelly loam is better suited to alfalfa, but it is necessary to lime the land heavily in order to start this crop, and as much as 2 tons of ground limestone an acre have been applied on some fields. When the alfalfa roots reach the lime strata, the crop grows luxuriantly. For this reason this soil may be considered more valuable for dairy farming than Hoosic soils of the same texture.

Copake gravelly loam, broken phase.—The broken phase of Copake gravelly loam is similar to the broken phase of the Hoosic soils, already described, as regards position and surface relief. Soil of this phase contains much carbonate material near the surface and, although of steep and broken relief, the land supports a good grass cover and is used by many farmers for pasture.

Copake fine sandy loam.—Copake fine sandy loam occupies a similar topographic position to Copake gravelly loam. It is better developed between Troy and Valley Falls than elsewhere. It is similar in appearance to the gravelly loam and differs from that soil mainly in texture. It contains some gravelly spots, but as these are not large they are comparatively unimportant. In the southwestern

part of the county in the town of Schodack, several small low-lying disk-shaped areas, which consist of loamy sand, are included with mapped areas of this soil, and these spots are fairly productive.

This soil, like Copake gravelly loam, is used for a wide range of crops. In addition to crops utilized in dairying, market-garden crops and fruits are grown. Alfalfa is an important crop. Crop yields are slightly lower than on Copake gravelly loam except where the land is highly fertilized, and in such places they are about equal. Fertilizer is necessary on this soil, as on the other sandy and gravelly substratum terrace soils, in order to obtain even moderate results. This soil, where allowed to lie fallow or in pasture, contains much poverty grass, some bent, running cinquefoil, and lady's tobacco. A comparatively large proportion of this land, as well as of Copake gravelly loam, is under cultivation. The leading crops are clover, timothy, alfalfa, corn, oats, rye, potatoes, and vegetables.

Schodack gravelly fine sandy loam.—Schodack gravelly fine sandy loam occupies the hummocky-surface gravelly areas scattered along the valleys in the western half of the county. It has a brown mellow gravelly sandy loam surface soil which grades at a depth of 5 or 6 inches into yellowish-brown firm but friable gravelly loam or gravelly fine sandy loam. This material becomes slightly paler in color below a depth ranging from 15 to 20 inches, but there is little change in structure. This material is underlain, at an average depth of 24 inches, by a substratum of mixed sand and gravel which is fairly loose and open in structure, and this material, in turn, grades, at a depth ranging from 5 to 8 feet below the surface, into bluish-gray partly cemented highly calcareous gravel. The entire soil mass contains much quartz and shale gravel. In the upper part of the substratum, at a depth ranging from 3 to 5 feet, is much partly disintegrated limestone gravel from which the carbonates have been removed, leaving a brown shell or a brown soft spot in the gravel mass. The gravel range from less than 1 inch to several inches in diameter, the quartz gravel being the larger and the smaller shale gravel forming the greater part of the gravelly material. Scattered throughout areas of this soil are small bodies in which the gravel are of cobble size, ranging from 6 to 8 inches in diameter, and consist of quartz or quartzite. Such areas are indicated on the map by stone symbols.

Drainage is inclined to be excessive, and crops sometimes suffer in dry seasons. On some spots the surface soil has been removed by erosion, and these spots are agriculturally inferior to the rest of the soil.

At one time Schodack gravelly fine sandy loam was all cleared and used for crops or pasture. Some of the land has been allowed to grow up in *Spiraea*, sweetfern, and birch and aspen sprouts, and other areas are covered with cinquefoil and other small weeds and shrubs, which grow on abandoned sandy soil. Pastures are comparatively poor and contain much poverty grass, lady's tobacco, and devils-paintbrush where unimproved, but where improved the sod contains more bentgrass and even some bluegrass. Most of the land is used for pasture, although small areas are used for such crops as alfalfa, clover, timothy, corn, and oats. Yields of all crops, except alfalfa, are rather low. Alfalfa is successful when once established, but it is necessary to lime the land heavily in order to get this crop

started. When the roots reach the lime in the substratum, the success of the crop seems assured.

Schodack gravelly loam.—Schodack gravelly loam is less extensive than Schodack gravelly fine sandy loam, and the two soils are closely associated. Most areas of the gravelly loam show evidence that the fine sandy surface material has been removed by erosion and a surface soil developed from the gravelly material beneath. Some spots occur where the loamy surface material has been removed, and the gravelly and sandy substratum is exposed. Many spots of this kind occupy the exposed brows of the kames and eskers.

Schodack gravelly loam is used for about the same crops as Schodack gravelly fine sandy loam. Little fertilizer and manure are used with this soil, and crop yields are generally poor. The production of alfalfa is about as successful on this soil as on Schodack gravelly fine sandy loam.

A few areas in the vicinities of Brunswick and Schodack, in which the surface soil is intact and is a naturally developed loam, are superior to the rest of the land. They have a smoother surface relief than the remainder of the soil. In other places, especially in the back valley, where this soil is derived from slate and contains some limestone, the surface soil is silt loam or loam. These areas, also, are superior to the eroded areas in crop production.

Otisville gravelly sandy loam.—Otisville gravelly sandy loam is developed on kames and eskers and is well distributed around the base of the Rensselaer Plateau and adjacent areas. The surface relief is decidedly hummocky, and drainage is so well established that the soil is droughty.

The profile is similar, except as regards texture, to that of Schodack gravelly fine sandy loam. Important differences between these two soils are that the Otisville soil contains no lime, or this material occurs at such a depth as not to influence crops, and that the substratum shows little or no cementation, the entire profile being loose and open in most places. The gravel material from which this soil is derived is more or less bedded, consisting of shale and slate, together with some sandstone. Near the base of the Rensselaer Plateau, besides slate and stone, the material contains much gravel from the grit formation. The substratum material of these areas is even looser and more open than in the rest of the soil areas, in which the soil material is derived almost entirely from shale.

Much more of this soil has grown up in sprout forest, consisting of maple, oak, white pine, gray birch, aspen, wild cherry, and sumac, than is common on the Schodack soils. The land is used for pasture and to some extent for hay, buckwheat, oats, and potatoes. The pasture grasses differ little from those growing on other soils developed on the kames, and they include poverty grass, lady's tobacco, and some bentgrass. Crop yields are low, especially in dry seasons.

Small areas, having a loam surface soil, are slightly better for crop production than the average for this soil. Some areas of loamy sand and sandy loam texture are less valuable for farm land than the rest of the soil. Small areas contain a noticeable quantity of stones, but these do not detract from the value of the soil for pasture land, although they lower its value for cultivation.

Claverack fine sandy loam.—Claverack fine sandy loam consists of a 24- to 48-inch layer of sandy material over lacustrine clays.

The surface relief is level, and surface run-off is slow. The clay substratum prevents free movement of water downward, resulting in the development of a mottled zone above the clay stratum.

The surface soil is brown mellow fine sandy loam in most places, but it varies considerably, ranging from very fine sandy loam to sandy loam, and in places it contains a noticeable quantity of small quartz and shale gravel. The subsoil, below plow depth, is yellowish-brown firm but friable material which is similar in texture to the surface soil. The color fades to pale yellow or greenish yellow in the lower part of the subsoil, becoming mottled with gray and rust brown below a depth of 34 or 36 inches. The clay substratum consists of mottled gray and brown compact calcareous clay which becomes bluish gray below a depth ranging from 5 to 6 feet. The material in the upper part of the profile is invariably acid, but the subsoil in many places is mildly alkaline or neutral. This soil occurs in small scattered areas in the western part of the county, between the sandy terrace deposits and the lacustrine deposits.

Nearly all the land is cleared and used for agriculture, and a rather large proportion is under cultivation to timothy and clover (for hay), corn, oats, rye, and vegetables. Yields are excellent, as high as on any soil in the county except in very wet seasons. The moisture-holding capacity is good, and even in dry seasons yields are satisfactory. This land is as well farmed and receives as much manure and fertilizer as any soil in the county. Where located near centers of population, as most of this land is, it is used for market gardening.

Some small areas mapped with this soil are of loamy fine sand texture but in all other characteristics are similar to Claverack fine sandy loam. They are slightly thicker over the clay substratum. This included soil is used for about the same crops, but yields are somewhat lower as might be expected on a lighter textured soil. The loamy fine sand areas contain little or no gravel.

Hudson silt loam.—The Hudson soils occur on the smooth or somewhat flat terraces that lie between the Hudson River trench and the line of hills that marks the western boundary of the Hudson Valley Plateau. Hudson silt loam is the most extensive and agriculturally the most important soil developed from lacustrine material. The surface soil is brown or grayish-brown granular mellow silt loam resting, at a depth of 7 or 8 inches, on a brown fine granular silt loam subsoil which passes within a few inches into yellowish-brown material of the same consistence. Below a depth of 18 or 20 inches is grayish-yellow fairly compact silty clay loam which extends to a depth ranging from 36 to 40 inches, where the subsoil material passes into alternately bedded silts and clays ranging from yellowish brown to greenish yellow with red bands. The upper part of the soil ranges from acid to neutral in reaction and becomes alkaline below a depth of 20 inches but does not effervesce with hydrochloric acid above a depth of 5 feet, although it does in most places below that depth. Some small areas contain gravel but not in sufficient quantity to interfere with cultivation. Drainage is fairly well established.

Nearly all this soil is cleared and used for farming. The original forest, judging by the few remnants, consisted of red oak, elm, hard maple, hickory, and white pine. The crops grown are timothy, clover,

and alfalfa hay; corn; oats; and potatoes. Many worn-out mowings are used for pastures which contain much bluegrass and bentgrass and some quackgrass. Apples and pears are grown on this land in the town of Schodack.

As this land is well farmed, yields in general are good. The soil is cold and late to warm up in the spring, compared with the gravelly terrace land, but it is much better in this respect than Hudson silty clay loam or Orono silt loam. Timothy and clover hay yields from 1 to 2½ tons an acre, corn for silage from 10 to 15 tons and for grain from 25 to 50 bushels, oats from 35 to 50 bushels, rye from 15 to 25 bushels, alfalfa from 2½ to 3½ tons, and potatoes from 100 to 150 bushels. Little fertilizer or lime is used on this land, but large quantities of manure are used.

Hudson fine sandy loam.—Hudson fine sandy loam is less extensive than Hudson silt loam but is just as important in the agriculture of the county. It occurs mainly in the northwestern part closely associated with the other Hudson soils. The surface relief is smooth and level, but drainage is good. The texture of the surface soil is lighter than that of the other Hudson soils, ranging from very fine sandy loam to fine sandy loam, but the subsoil, below a depth ranging from 20 to 24 inches, consists of compact buff-colored clay. Recurrent beds of lighter material occur in many places in the substratum. This soil is more strongly acid above a depth of 20 inches than the other Hudson soils, but it is of similar alkalinity below this depth.

The fine sandy loam texture of the surface soil renders this land easy to handle as compared with the other Hudson soils, and for this reason it is used for a wider variety of crops and more of it is used for cultivated crops. Fertilizers are used more extensively and more rye, potatoes, and vegetables are grown than on the other Hudson soils. Yields are slightly lower than on Hudson silt loam, unless the land is highly fertilized.

Hudson fine sandy loam, rolling phase.—Hudson fine sandy loam, rolling phase, differs from the typical soil in having a rolling or hummocky surface relief. In many places the surface soil has a very fine sandy loam texture and clay is not present above a great depth, although the entire soil mass contains much silty material. The soil material is alkaline from the surface down. The surface relief in general is smooth, except in a few small spots, from which the surface soil has been removed by wind erosion.

Soil of this phase is used almost exclusively for bluegrass pasture, and small areas are devoted to the production of timothy and clover hay.

Hudson fine sandy loam, broken phase.—Hudson fine sandy loam, broken phase, occupies the steep broken edges of areas of the typical soil and in few places occurs in strips more than a few hundred feet wide. Where cleared of forest the land is used for pasture, dominantly of bluegrass. This land is of little value for agriculture other than pasture, owing to its steep relief and the tendency of the soil to slide.

Hudson silty clay loam.—Hudson silty clay loam differs from Hudson silt loam in having a flatter surface relief, a grayer surface soil, and a clay substratum lying closer to the surface. It contains definite gray mottling above the clay stratum, which is absent in the other Hudson soils or is only incipiently developed. This soil

occurs on the level terraces from Troy southward to the Columbia County line in the vicinity of Muitzes Kill.

Hudson silty clay loam is the most fertile Hudson soil, but, owing to the difficulty of handling it, because of its coldness, and the difficulty of cultivation, it is limited to a narrow range of crops. Practically all the land is cleared and used for farming, including the production of pasture, hay, and small grains. Bluegrass and bentgrass are the leading pasture grasses, and timothy and alsike clover are grown for hay. Alfalfa is grown to a small extent but is subject to heaving in freezing weather. Small grains—wheat, oats, and rye—are grown more extensively than on any other soil, and yields are fairly good and compare favorably with the yields on Hudson silt loam. Little lime or commercial fertilizer is used on the average farm, but manure is relied on to maintain fertility, and superphosphate is used with small grains. Rollers and cultipackers are used on much of this land, for breaking clods and for packing the soil, in order to prevent heaving out of grains by frost. The yields of the crops grown compare favorably with yields on Hudson silt loam, but the range of crops that can be grown successfully is limited. The land is better suited to grass and small grains than to other crops.

Hudson silty clay loam, broken phase.—Hudson silty clay loam, broken phase, occurs along the outer, or stream, edges of the terraces and in the tonguelike narrow V-shaped valleys that extend back into these terraces. The surface relief is so steep in most places that land slides and erosion are constantly causing the formation of new surface soils, so that it is difficult for tree growth or other vegetation to get started, although lime-loving plants, such as sweetclover and alfalfa, grow in places. The less steep areas are used for pasture, as bluegrass and Dutch clover come in naturally and furnish good sod. Owing to the steep slope of the land, it is worth little for cultivated crops. The texture of the surface soil ranges from silt loam to clay, with silty clay loam predominating. Some gravelly areas are included, but these have little influence on the character of the soil.

Orono silt loam.—Areas of Orono silt loam are scattered over areas of the lacustrine soils, occupying level or slightly depressed imperfectly drained areas. The surface soil is dark-brown or grayish-brown granular silt loam to a depth of 5 or 6 inches where it passes into gray slightly firm silt loam which grades, at a depth of 10 or 12 inches into mottled gray and brown firm heavy silt loam. Below a depth ranging from 18 to 24 inches, the substratum is bluish-gray compact silty clay loam.

Most of the land is cleared and used for mowing or pasture, and it is used to a small extent for corn and oats. It furnishes good grass, principally timothy and alsike clover, for mowing, and the pastures contain much bluegrass and bentgrass. Yields of the crops grown are good, but this soil is limited in its range of adaptability to crops.

This soil as mapped includes small areas of fine sandy loam and very fine sandy loam, which have gray surface soils and in general have a lower crop value than the rest of the land. Such areas occur near East Greenbush, northwest of Van Hoesen, east of Muitzes Kill, and northeast of Melrose.

Orono silt loam, dark-colored phase.—The dark-colored phase of Orono silt loam has a dark-brown surface soil about 6 or 8 inches thick, containing considerable organic matter. This soil occupies poorly drained depressions, and the subsoil is highly mottled with gray and rust brown. Below a depth of about 20 inches the material consists of bluish-gray clay or clay loam. This soil is developed mainly in the southwestern part of the county in the town of Schodack.

This land is wooded or in wood lots, in which elm, ash, and white oak grow. Some areas are used for pasture, but in general, the land is too wet for crops other than grass.

SOILS OF THE PRESENT FLOOD PLAINS

The soils of the present flood plains include Genesee loam, Genesee fine sandy loam, Ondawa fine sandy loam, with a high-bottom phase, Ondawa loam, Eel silt loam, with a low phase, Podunk silt loam, Saco silt loam, and alluvial soils, undifferentiated. Of these, the Genesee and Ondawa are the better drained.

The Genesee soils occur mainly on the Hudson River flood plain and to less extent along the upper course of Hoosic River and Walloomsac River. Both the Genesee and Ondawa are recent soils and, as they are unleached, are fairly fertile. They range from silt loam to fine sandy loam in texture. They are utilized for corn, both for grain and silage; market-garden crops, in which sweet corn is the leading crop; timothy and clover hay; and oats in some places, especially on the bottom lands along Hoosic River. These soils are very productive when well fertilized. Their nearness to markets determines the kind of crops grown. Areas close to Albany and Troy are used almost exclusively for the production of market-garden crops, and areas in the back valley for crops used in the dairy industry.

The Eel soils are associated with the Genesee soils, differing from those soils mainly in that they are imperfectly drained. The Podunk soils occupy the imperfectly drained areas associated with the Ondawa soils. They are used principally for mowing or pasture. Eel silt loam, low phase, and Saco silt loam are both of small extent, poorly drained, and either uncleared or used for pasture. On these soils, coarse grasses, rushes, and sedges abound, and old pastures are grown up to alder, willow, and soft maple.

Genesee loam.—Genesee loam occurs only on stream-bottom land along Hudson River south of Rensselaer, mainly on Papscanee Island; along Hoosic River near Eagle Bridge; and along Walloomsac River, extending to the Vermont State line. The land is subject to overflow. The soil in the areas along the Hoosic River bottoms is not so alkaline as that in other places.

Genesee loam has a dark-brown or brown mellow silt loam or loam surface soil 8 or 10 inches thick, which grades into brown or yellowish-brown mellow loam or silt loam, the material remaining the same in texture and structure to a depth ranging from 40 to 48 inches and in some places becoming slightly heavier below this depth. This soil is comparatively uniform throughout its entire area, and it is well drained and aerated. In some places the surface soil may be acid, but in most places it is mildly alkaline or neutral.

The subsoil everywhere is alkaline. In a few places this soil contains some gravel which does not interfere with cultivation.

Genesee loam is naturally a fertile soil, well suited to corn, grasses, and vegetables, and it produces good yields even without the use of fertilizers. Areas of this soil on the islands of Hudson River are devoted to market-garden crops. Sweet corn occupies the largest acreage, and three crops may be produced from the same ground in one season. Squash, beans, celery, cabbage, tomatoes, spinach, and carrots are grown rather extensively. Yields of vegetables are exceptionally good where commercial fertilizers are used to force the crops. Some alfalfa is grown. Some uncultivated fields support a luxuriant growth of horseweed, goldenrod, wild parsnip, and such grasses as timothy, bluegrass, and quackgrass. The use of this soil for market-garden crops is due both to adaptability and location. Areas in the Hoosic and Walloomsac River bottoms are used for growing crops utilized in dairy feeding, such as corn (for silage and grain), oats, and hay. Yields are good, notwithstanding the fact that little fertilizer is used. Genesee loam is one of the most productive soils in the county and compares favorably with any soil in the East for corn, grass, and vegetables, and it ranks well with the corn soils of the Middle West.

Genesee fine sandy loam.—Genesee fine sandy loam is associated with Genesee loam and is similar to that soil except in texture. The surface soil is lighter brown and the substratum becomes lighter in texture in the fine sandy loam. This soil occupies slight swells in the bottoms and lies slightly higher than Genesee loam. It is even better drained than the loam, and it is used for the same crops, but crop yields are slightly lower, except where the land is heavily fertilized.

Ondawa loam.—Ondawa loam is the most extensive bottom-land soil in the county, and it occupies much of the well-drained land along the larger streams, particularly along the upper part of Hudson River and the lower reaches of Hoosic River. The entire soil, like the other Ondawa soils, is acid.

Ondawa loam consists of brown mellow loam or silt loam to a depth of 8 or 10 inches, at which depth it passes into yellowish-brown mellow loam or silt loam, which becomes paler in color and lighter in texture with depth, in many places having a pale-yellow fine sandy loam substratum below a depth of 36 inches. Some areas contain a noticeable quantity of gravel. According to location, this soil is utilized rather extensively for growing hay, corn, oats, and vegetables. Areas near towns and cities are used for market gardening, but most of the soil is used for growing timothy, redtop, and clover for hay, although the fields are infested with much quackgrass. A fair acreage is in pasture, but this soil is not used for pasture so much as the lower bottom-land soils. Ondawa loam is not quite so productive as Genesee loam, but it ranks next to this soil in productiveness.

Ondawa fine sandy loam.—Ondawa fine sandy loam is associated with Ondawa loam, in many places being developed along the stream edges and in other places occupying the entire bottom. Drainage is well established, owing to the generally light or loose condition of the substratum.

This soil is used for the same crops as Ondawa loam, and yields are slightly lower except where fertilizers are used. The lighter texture makes this soil easier to cultivate. The surface soil in general ranges from fine sandy loam to sandy loam. A few areas have a loamy fine sand texture, and some are gravelly.

Ondawa fine sandy loam, high-bottom phase.—The high-bottom phase of Ondawa fine sandy loam differs from the typical soil in that it lies slightly above overflow. This position has had the effect of giving the surface soil a slightly lighter color, but the lower part of the profile remains about the same as in the typical soil. In many places this soil contains gravel or sand at a depth ranging from 36 to 48 inches, which affords excellent drainage conditions. The texture ranges from very fine sandy loam to fine sandy loam. This soil is handled much the same as the soils developed on the terraces; that is, it is used for the same crops as the Hoosic soils and is fertilized in a similar manner. Crop yields are slightly higher than on the Hoosic soils.

Eel silt loam.—Eel silt loam occupies the imperfectly drained bottom land and is derived from alluvial deposits. It is subject to overflow and occupies a somewhat lower position than the Genesee soils. The surface soil is dark-brown granular loam or silt loam, grading, at a depth ranging from 7 to 10 inches, into brown or yellowish-brown firm but friable silt loam or loam, which changes, at a depth ranging from 18 to 24 inches, into mottled yellowish-brown and gray, in places bluish-gray, firm or compact silt loam or silty clay loam, continuing to a depth of more than 3 feet. In places the soil mass contains considerable gravel throughout, and in most places, except on Papscanee Island, the substratum contains gravel. The surface soil and subsoil, that is the layers above the mottled zone, in many places are acid, and the substratum is alkaline.

From 70 to 80 percent of the land is under cultivation or in pasture—even the areas that have grown up in alder and willows are used for pasture. Kentucky bluegrass and bent are the leading pasture grasses. Hay is cut from a fairly large acreage, but the acreage of tilled crops is comparatively small. Wild carrots and wild parsnips are common weeds in hayfields. Timothy, redtop, and clover are seeded on hay land. The mowings are left until they become filled with weeds and are then used indefinitely for pasture. The tilled crops are corn and oats, which give fairly good yields.

Eel silt loam, low phase.—The low phase of Eel silt loam occurs in the Hudson River bottoms south of Rensselaer, where it occupies rather low depressed areas, or swales, having poor natural drainage. The surface soil is dark-brown silt loam which is underlain, within a few inches, by yellowish-brown material mottled or spotted with drab gray and rust brown, which becomes firm but friable, with increased mottling of gray and brown. The structure is much the same as in the Genesee soils. In most places the soil is matted to the grass roots. Most of the land is used for pasture or is grown up to willow and alder. Many fields are covered with horseweed and trumpetweed, but where seeded they furnish good pasture. This soil is alkaline in the subsoil, and most of it is neutral in the surface soil.

Podunk silt loam.—Podunk silt loam occupies the imperfectly drained bottom land associated with the Ondawa soils. These soils are in general acid throughout, although in a few places they are neutral or slightly alkaline in the substratum.

Podunk silt loam has a dark-brown or brown mellow silt loam or fine sandy loam surface soil which grades, at a depth of 7 or 8 inches, into yellowish-brown mellow but firm fine sandy loam or loam, and this, in turn, passes, at a depth of 20 inches, into the brownish-gray, mottled with brown, firm and compact loam or silty clay loam substratum. Some gravelly areas occur, in which drainage is a little better and the mottled gray substratum lies at a depth ranging from 24 to 30 inches below the surface.

This soil is used extensively for mowing and pasture. It supports a fair cover of timothy, redtop, and clover. The pasture grasses include much bentgrass. A number of pastures have grown up in willow and alder. Little of the land is used for cultivated crops, although some corn and a little oats are grown. The soil can be used to some extent for shallow-rooted crops without additional drainage.

Saco silt loam.—Saco silt loam occurs on poorly drained bottom land in nearly all parts of the county. It is characterized by a 4- to 6-inch dark surface soil high in organic matter, overlying a mottled drab-gray and rust-brown tough silty clay loam subsoil which passes below a depth ranging from 15 to 20 inches, into tough and plastic bluish-gray clay containing rust-brown spots. In some places the clay below a depth of 36 inches may be calcareous, and in most places it is acid above this depth.

This soil is poorly drained, and most of it is covered by a growth of cattails or coarse grasses or has grown up in alder. Some areas are swampy and support a growth of brush, moss, and tamarack, and a few arborvitae. In many places the surface soil is acid, and the substratum is alkaline. The cleared areas are in pastures which contain many rushes and sedges.

An area of approximately 100 acres near Haynersville has a marl subsoil below a depth ranging from 10 to 24 inches, and the surface soil is mucky material. Some of this land is drained and is used with indifferent success for market-garden crops.

Alluvial soils, undifferentiated.—Alluvial soils, undifferentiated, are mapped along small streams in all parts of the county. They consist of mixed soils of no definite texture and in most places are imperfectly or poorly drained. This classification includes small spots of practically all the bottom-land soils mapped. Soils are included which receive wash from the reddish-brown calcareous material and from soils derived from blue slate. In places the material contains a considerable quantity of stones, in other places much gravel, and small areas consist of clay, some of muck. About half of this bottom land is cleared and used for mowing or pasture. Many areas are covered with alder, willows, huckleberries, and other water-loving shrubs and trees. Owing to the mixed character of this soil material, its value for crop production is extremely variable, most of it being of little value except for grass and in some favored spots for corn and oats.

SOILS OF THE RENSSELAER PLATEAU AND TACONIC MOUNTAIN SECTION

The Hermon and Woodbridge soils of the grit plateau are both well drained, but they contain considerable stone which detracts from their use for crops. They are fairly good soils for the grasses, and the pastures contain much bentgrass and sweet vernal and a comparatively small quantity of poverty grass. These soils contain larger amounts of organic matter than most of the upland soils, but their elevation is such that corn does not mature with certainty. Small patches of corn, buckwheat, potatoes, and vegetables are grown, and some land is in mowings which contain much redtop. Most of the area of these soils, owing to stoniness, is in forest, with only small patches under cultivation. Danby gravelly sandy loam occupies comparatively small areas consisting of gravelly and sandy droughty soil that is little used for agriculture. The Macomber soils occur at high elevations on the Taconic Mountains. They are comparatively shallow, and correspond to the Nassau soils in all respects, except elevation, amount of organic matter accumulated on the surface, and the development of a gray layer under the forest duff. The comparatively small cleared areas were once used for pasture for sheep, but with the passing of sheep raising much of the pasture land has grown up in blueberries and brush. The extensive area of imperfectly and poorly drained soil classed as Whitman stony loam is for the most part in forest, although small cleared areas are used for pasture supporting a fair grass cover, together with much moss and ferns.

Hermon loam.—Hermon loam is well scattered over the Rensselaer Plateau, occurring on smooth ridge tops and gently sloping hillsides. It is comparatively stone-free, although many small fragments and some boulders of the grit formation occur, which in most places have been piled into fences around the fields or around a large stone or rib outcrop in the field. This is a well-drained soil.

Hermon loam belongs to the class of soils which, under forest cover, in most places have several inches of gray fine sandy loam soil under the forest duff. In cleared fields the soil is dark-brown mellow loam or fine sandy loam, to a depth of about 7 or 8 inches. This material is underlain by yellowish-brown firm but friable loam which grades downward into pale yellowish-brown or pale-yellow light loam, gradually changing, at a depth ranging from 20 to 24 inches, into gray firm or compact gritty till. The substratum in places is very compact and has a tendency to become hard on exposure, but it is easily broken down and is not sufficiently hard or compact to prevent the free movement of moisture. In other places the compaction is less evident, and the material has a tendency toward looseness.

All this land is or has been under cultivation, but at present most of it is in mowing or pasture, with tilled crops, mainly oats, buckwheat, and potatoes, confined to small patches. These crops do fairly well considering the small attention given to farming on this soil. Although this is not classed as a stony soil, it contains enough stones to interfere with cultivation, and this is the principal drawback to farming it. The land is better suited to grass than would be expected. Bentgrass and sweet vernal, together with comparatively small amounts of poverty grass, grow in the pastures. Steeple-

bush is the principal pasture pest. Mowings consist of redtop, timothy, and clover, and yields of hay average about 1 ton an acre. Much of the land has been taken out of cultivation and has grown up to birch, sumac, wild cherry, and aspen.

Hermon stony loam.—Hermon stony loam is very extensive on the Rensselaer Plateau where it occupies smooth ridge or hill tops and steeply sloping hillsides. It is similar to Hermon loam, except that it contains much more stone which consists, for the most part, of boulders of the grit formation. Much of this land is forested with spruce, hemlock, gray birch, yellow birch, beech, hard maple, red oak, and basswood. Most of the clearings are in pastures which are growing up to sprouts. This soil is not valued very highly for farming. Where the pastures are kept free from brush it has about the same value (or slightly less) for grazing as Hermon loam. This stony soil has been used for pasture in the past to a much greater extent than it is used at present, but most of it has never been cleared, although it has been cut over many times. The larger areas are in the higher parts of the plateau, and it is doubtful that they ever will be used for farming.

Hermon stony loam, shallow phase.—Hermon stony loam, shallow phase, is similar to the typical soil, except that bedrock, consisting of the hard grit formation, is reached at a depth ranging from 2 to 3 feet below the surface, and in places rib rock protrudes. In some places the subsoil is comparatively heavy and shows some mottling, owing to the slightly retarded drainage.

This shallow soil is possibly of greater value for farming than the typical soil, as most of it occurs on the almost flat ridge tops, many of which have been cleared and have been used for pasture in the past, although most of them are now abandoned.

Hermon stony loam, imperfectly drained phase.—The imperfectly drained phase of Hermon stony loam occupies the gentle slopes associated with typical Hermon stony loam, which receive much seepage water. This soil consists of dark-brown loam containing some organic matter, but it is not mucky in the surface soil except in small seepy spots. The subsoil, lying at a depth of 6 or 7 inches, is yellow-brown loam which becomes highly mottled with gray and rust brown below a depth of 12 or 15 inches. This material rests on gray rather compact but friable gritty till at a depth of 2 feet below the surface.

The imperfectly drained phase of Hermon stony loam is, or rather has been, extensively used for pasture and, like most pasture in this section, contains much fern, *Spiraea*, and blueberries, and some birch. Where the brush has been kept down the sod is fairly good and consists for the most part of bent, with rushes, sedges, and other water-loving grasses on the seepy spots. Many of the higher flats are covered mainly with spruce, together with some hemlock, hard maple, and white birch. Soil of this phase embraces some of the best natural pasture land in the county.

Woodbridge gravelly loam.—Woodbridge gravelly loam occurs on the lower and smoother parts of the grit plateau. The surface relief is slightly more rolling than that of Hermon loam and, although the substratum is heavier and more compact, the soil is almost as well drained as Hermon loam.

The profile of this soil is similar to that of Hermon loam, with the exception that the substratum, below a depth of 20 or 24 inches,

is much heavier and more compact than that of the Hermon soil. The soil contains much more gravel and less stone than Hermon loam.

The cleared area of this soil is greater than the cleared area of Hermon loam, and a much larger area is still used for farming. Mowing and pasture occupy the greater acreage, with only a small acreage devoted to other crops common to this section. Yields of grass, small grains, and buckwheat are fairly good. Some vegetables for market are grown on a small acreage in the vicinity of Grafton. Dairying is the leading type of farming but it is developed to only a small extent. Redtop, timothy, and clover predominate in the mowings, and the pasture grasses are slightly better than on Hermon loam. Bent is the leading pasture grass, with some bluegrass, sweet vernal, and poverty grass. On worn-out land poverty grass is the dominant grass. Hardhack and ferns are common pasture pests. Farming is not so important on this soil since the days when beef cattle and sheep were raised, and much of the land formerly cultivated is reverting to forest of aspen, scrub birch, hawthorn, and elm.

Woodbridge gravelly loam, heavy-subsoil phase.—The heavy-subsoil phase of Woodbridge gravelly loam differs from the typical soil in two respects—it has a smoother surface relief and a heavier subsoil. The compact and heavy stratum, occurring at a depth ranging from 20 to 24 inches, serves to retard to some extent the downward movement of water, causing strong mottlings of gray and rust brown to develop just above the heavy layer. These areas occupy smoothly rounded hills of fairly deep till comparatively free from stone, although they contain much gravel.

Land of the heavy-subsoil phase is used extensively for mowing and pasture. The yield of hay is fairly good where the mowings are reseeded at regular intervals. Much bentgrass grows in the pastures.

Woodbridge stony loam.—Woodbridge stony loam, as the name implies, contains considerably more stone than Woodbridge gravelly loam, and the two soils differ only in that respect. The quantity of stone is sufficient to limit cultivation. Much of this stony Woodbridge soil is forested with red oak, hard maple, beech, aspen, and white birch. Pastures are in much the same condition as the pastures on the other stony soils of the plateau section, being overgrown with *Spiraea*, blueberries, and birch and fast reverting to forest. The value of this soil for pasture is slightly less than that of the stony Hermon soil, as the encroachment of ferns, brush, and trees is more persistent.

Woodbridge stony loam, heavy-subsoil phase.—Woodbridge stony loam, heavy-subsoil phase, is similar to the heavy-subsoil phase of Woodbridge gravelly loam, but its stone content is greater. Where cleared, the land is used almost exclusively for pasture. Much *Spiraea* and other brush grow in the pastures, as little care is given to keep the brush down. The forest consists mainly of hardwoods—red oak, beech, and maple predominating.

Macomber slate loam.—Macomber slate loam occupies the saddles and the somewhat flattened ridge tops and spurs of the Taconic Mountain Range in the eastern part of the county, where most of it lies at an elevation above 1,500 feet. It belongs to the same class of

soils as the Hermon soils, in that a gray layer is developed under the forest duff, but this disappears under cultivation.

In cleared areas the surface soil, to a depth of 5 or 6 inches, is brown or dark-brown silt loam or loam, containing a quantity of slate chips and some fragments of quartz. This material passes into yellowish-brown firm but friable slate loam or silt loam, which changes at a depth of 12 or 15 inches to pale-green or pale greenish-gray firm silt loam containing slate chips, and this material, in turn, rests on bedrock of blue slate at a depth ranging from 20 to 24 or, in places, 30 inches. Drainage is well established. Some stony areas have numerous quartz boulders on the surface, and such areas are mainly in forest or old pastures which have become overgrown with brush and weeds.

At one time nearly all this soil was cleared and used for pasturing sheep, but at present much of the land has grown up to red oak, chestnut oak, yellow birch, white birch, hard maple, basswood, hemlock, and spruce, many of the areas containing an almost pure stand of spruce and hemlock. Most of the pastures are abandoned, and even those in use contain much hardhack (*Spiraea*), blueberries, and poverty grass, together with some bentgrass and very little bluegrass. Many areas are covered thickly with blueberries and furnish excellent picking grounds for this fruit.

Macomber slate loam, shallow phase.—Macomber slate loam, shallow phase, differs from the typical soil in that the thickness of soil over bedrock is less, it contains more rock ledges and outcrops, and there are more loose quartz boulders on the surface. The surface relief is steeper, in general, on soil of this phase than on the typical soil. A large area is in forest, and the pastures are much overgrown with brush.

Danby gravelly sandy loam.—Danby gravelly sandy loam is developed on kames, associated with the Hermon soils, in the valleys and along the valley walls of the Rensselaer Plateau section. The surface relief is decidedly hummocky, and, owing to the loose gravelly substratum, drainage is excessive.

The 5- or 6-inch surface soil consists of brown gravelly loam. It is underlain by a yellowish-brown only slightly firm subsoil which becomes pale yellowish brown and sandier with depth, reaching mixed sand and gravel at a depth ranging from 20 to 24 inches. Below a depth of 3 feet the gravel becomes bedded, and in many places the material is rather roughly assorted and stratified. The parent material is almost exclusively of the grit formation.

Danby gravelly sandy loam has a very low agricultural value. Where cleared, it is used for pasture which furnishes only meager grazing.

Whitman stony loam.—Whitman stony loam occupies low areas on the Rensselaer Plateau where poor drainage has developed a waterlogged or semiswampy soil condition.

The soil is dark brown and mucky to a depth of 8 or 10 inches, where it rests on mottled yellowish-brown, gray, and rust-brown material. It passes, below an average depth of 2 feet, into gray till which in most places is compact. This soil contains a noticeable quantity of stones, and in a few places the stones are both large and plentiful.

Most of this soil is in its native condition, that is, covered by a growth of spruce, hemlock, and tamarack. A few small areas have been cleared and are used for pasture, but they are grown up with much *Spiraea* and alder. In common with most low-ground pastures, besides coarse water grasses, the land supports considerable rush and sedge growth. Where drained, land of this kind is used successfully in parts of New England for small grains, mowing, corn, and vegetables.

MISCELLANEOUS LAND TYPES

Of the land types included in this group, muck, peat, and marsh are poorly drained, and made land is for the most part well drained. A few areas of muck are drained and used for market-garden crops. Peat and marsh are largely unusable under present conditions. Rough stony land is mainly in forest, and the rock outcrop areas are associated with it.

Muck.—Muck occurs in comparatively small areas scattered over the lowlands—mainly filled-in lakes—and along sluggish streams. It consists of partly disintegrated brown or almost black organic matter derived from acid woody material, mixed with mineral soil, and ranges in thickness from 20 inches to 5 feet. The present tree growth is soft maple. As compared with the peat deposits of this county, most of the muck is shallow. The bottom of the layer may be less disintegrated, and it rests on a gray compact fine sandy loam or clay bottom, but in a few small areas the deposits rest on beds of marl. Aside from the small areas over marl, nearly all the muck is highly acid. Most of the muck deposits are woody muck. In places, however, the muck is graminous and is at present covered with grasses. Most of the muck is covered with forest of alder, tamarack, and soft maple. Small areas support a cover of swamp grasses and are used for pasture.

Peat.—Peat occupies the deep filled-in-lake beds lying at higher elevations, and it consists of deposits of brown fibrous woody organic material which is highly acid, coniferous in origin, little digested in the surface layer, and almost raw below. Its present condition is low and swampy, and it contains tussocks caused by logs and roots which are covered with moss. The tree growth is mainly hemlock and tamarack. This land is not used for agriculture. The areas of peat are confined almost exclusively to the Rensselaer Plateau and are closely related to the Adirondack peats.

Marsh.—Marsh occurs along the tidal flats of Hudson River. It consists of mud covered by a growth of coarse grasses, including some wildrice, over which the tides of Hudson River rise and fall. This land is unused and in its present state is of little value.

Made land.—Made land consists of the heaps of gravel, sand, and mud dredged from the bottom of the Hudson River channel and piled on the banks of the river south from Rensselaer; north from Troy, stone, shale, and mud dug from the Barge Canal cover considerable adjacent areas; and near the cities of Troy and Rensselaer are filled-in low areas incident to the disposal of material from building excavations and trash dumps. In most places this material is raw and covers the original land surface to a depth of several feet. Made land is of little or no agricultural value.

Rough stony land.—The material classed as rough stony land consists of all land (with the exception of rock outcrop) too rough or stony to be of practical agricultural value. In this county it includes mainly three series of soils. The areas developed on the Rensselaer Plateau are very stony Hermon soils, and those on the Taconic Mountains are very stony Dutchess and Macomber soils. The soils on the Taconic Mountains consist for the most part of shallow soils with bedrock outcropping and little loose rock material on the surface, and on the grit plateau the soils are very stony but deeper. Practically all this land is forested and can best be utilized for forestry.

Rock outcrop.—Those areas associated with rough stony land, which consist mainly of rock outcrop, are for the most part steep and stony. Such land has very little value even for growing trees, as it supports a scanty growth. Even where the land supports a good forest cover the terrain presents much difficulty in lumbering operations.

AGRICULTURAL METHODS AND MANAGEMENT OF THE SOILS

The principal type of farming is dairying which takes the form of the production of fluid milk for market. Of the 7,594,717 gallons of fluid milk sold in 1929, as reported by the Federal census, a part was sold on the local markets of the capital district, and the rest was shipped to New York City.

The methods followed on the farms of this county are those generally accepted in the dairy sections of the State. There are very few farms that do not follow dairying as the principal farm activity, accompanied by market gardening, fruit growing, or poultry raising as side lines.

Fruit growing is confined mainly to the southwestern section of the county, which is a northern extension of the Hudson Valley fruit belt. On most of these farms apples are the principal fruit, and McIntosh, Baldwin, Northern Spy, Wealthy, and Rhode Island Greening are the leading varieties. Bartlett and Kieffer are the leading varieties of pears. Only a few of the fruit farms do not engage in dairying and poultry raising as a side line. The farms in the back valley—Stephentown, Berlin, and Hoosick Valleys—engage in dairying exclusive of other forms of agriculture, except the growing of potatoes. Only on the Hudson River bottom land south from Rensselaer are farms devoted exclusively to the production of market-garden crops. Agricultural methods vary to conform to the different types of farming.

The farms of the plateau section differ from those in the rest of the county in degree of development. They include smaller operating units depending on the same sources of income. Most of the land on the Rensselaer Plateau and Taconic Mountains is forested, and there are comparatively small clearings, but in other sections most of the land is cleared, and only small scattered wood lots occur on nearly every farm.

Rotations of crops differ considerably in different sections. The general rotation followed in the dairying section is (1) corn, (2) oats, (3) timothy and clover for 4 or 5 years. In the rougher sec-

tions mowings may run for several years, and when the mowing fails the land is used for pasture, particularly where the natural grasses are good. On the sandier soils of the terraces, rye often replaces oats in the rotation, and wheat is used on the clayey soils. In the limestone valley region and Taconic Mountain foothills the most common rotation is (1) corn, (2) oats or buckwheat, followed by hay.

Sweet corn is grown on the river bottoms. Many market gardeners plant crops which require a minimum of hand work and depend mainly on plow and cultivator work.

Alfalfa is planted with little regard to rotations and is allowed to stand until it begins to fail, which depends much on the soil on which the planting is made. On soils with calcareous substrata, alfalfa invariably lasts longer.

Most of the old orchards are in sod, and the young or high-producing orchards are cultivated. Cultivation starts in spring and continues to the middle of summer when some cover crop, as rye or buckwheat, is sown. All orchardists spray and fertilize the trees.

Although erosion is much in evidence, few farmers realize the extent of damage from this source. On many farms row crops are planted down the hill at right angles to the contours. Strip cultivation is practiced on a few farms to prevent or check erosion, but this practice is not general.

As already pointed out, many of the farms on which dairying is the principal activity, use manure to excess, with little lime and less commercial fertilizer. The use of manure in excess of 10 loads an acre, according to the Cornell Agricultural Experiment Station (*10*) does not give returns to justify its use. The manure should be supplemented by phosphatic fertilizer, as the continued use of manure without phosphate causes, in time, a condition akin to phosphatic starvation. On the other hand, a large area of the farm land receives far too little manure for satisfactory crop production.

On most farms mowings are allowed to run for indefinite periods. It is well recognized that under present conditions much of the hay is not needed. However, the area actually mowed should produce good-quality hay even if yields are not so high, which means that the meadows should be kept comparatively free from weeds.

The bottom-land soils do not need fertilizer for general farm crops, except where they have been heavily cropped or intensively used for market-garden crops. Areas of bottom land below reservoirs and power dams may become deficient in plant nutrients because of a lack of overflows, with a resultant shortage of soil deposits. Rotations are not generally followed on bottom lands.

Most of the sandier soils developed on the terraces and kames, such as the Hoosic, Copake, Schodack, Otisville, and Danby soils, are low in inherent fertility and are in need of complete fertilizer for nearly all crops.

The soils derived from glacial till, in general, will produce fairly good crops with the use of lime, manure, and phosphatic fertilizers, ranging widely, however, in the quantity applied, depending on the type of soil and its cultural condition.

Experiments by the Cornell University Experiment Station (*9*) on soils similar to the Pittsfield and Stockbridge, indicate that little

is gained in crop yields through the addition of potassium to lime, nitrogen, and phosphatic fertilizers, whereas yields are increased by potassium on the Dutchess, Bernardston, Nassau, and allied soils. Soils of the Cossayuna, Troy, and Albia series are intermediate between soils of these two groups, and this indicates that small quantities of potassium may be used advantageously on these soils, and that phosphatic fertilizers in conjunction with lime and manure are all that may be needed, except where special crops or heavy cropping is practiced. Soils derived from more or less calcareous clay and silt, like the Hudson and Orono soils, show little need of potassium. It is well known that the sandy soils, those of the Hoosic and Copake series, are deficient in all three elements, phosphorus, nitrogen, and potash, and are therefore not only improved by potash fertilizers but need larger applications than other soils of this county.

Practically all the soils respond to nitrogen, applied through turned-under crops, the growing of leguminous crops, manure, or commercial carrier. The better the soil, the greater the response to nitrogen, and by this is meant the structure and base-exchange properties of the soil.

Practically all the soils respond to phosphorus treatment. The response is greater, however, in the Stockbridge, Pittsfield, and Cossayuna soils, than in most of the other soils and less in the Albia, Alps, and Boynton.

A 10-year rotation recommended by the Cornell University Agricultural Experiment Station (7) for the Lordstown, Volusia, and Wooster soils will apply generally to the acid soils of this county.

Other rotations which will apply to the Cossayuna and Albia soils as well as to the Dutchess, Bernardston, Hermon, and Gloucester soils are as follows: A—(1) Buckwheat, (2) oats, (3) clover, (4) timothy; B—(1) buckwheat, (2) corn, potatoes, or cabbage, (3) oats, (4) clover, (5) timothy; C—(1) corn, potatoes, or cabbage, (2) buckwheat, (3) oats, (4) clover, (5) timothy.

Rotations applicable to the Stockbridge and Pittsfield soils are (1) corn, (2) beans or potatoes, followed by oats or wheat, and (3) grass which remains from 2 to 4 years.

The soils of the Cossayuna group are intermediate between the two extreme soil groups. They are similar to the Lansing soils in lime requirements and crop adaptations.

Corn for silage and corn for grain occupy about equal acreages. As corn begins the rotation after turning sod, manure is usually applied for this crop, but the application should generally be light and supplemented by an acre application of about 300 to 400 pounds of 16 percent superphosphate.

West Branch Sweepstakes and Oswego, two varieties of silage corn, recommended by the Cornell Station for the lower part of Cayuga County, should be adapted to the Hudson lowlands of Rensselaer County. At higher elevations a large flint variety is better suited. For husking, on elevations such as the Rensselaer Plateau, smaller flint varieties similar to King Philip should be used. Many of the dairy farms provide a surplus of manure, whereas other farms do not have enough to cover all the land needing manure. On these farms the use of ammoniated superphosphate or such commercial fertilizers as 4–16–4 or 4–12–4, in sufficient quantities to make up the

deficiency, is suggested by the Cornell Station. Sweet corn should receive the same fertilizer treatment as field corn, but heavier applications are advised.

In seeding clover and timothy, the Cornell Station recommends that red clover be seeded on well-drained soils, that the quantity of red clover seed be decreased and of alsike increased on the imperfectly drained lands, and red clover left out entirely on the wet lands. On the more acid soils redtop should be added to the grass mixture. On the wetter and more highly acid soils redtop should be used in preference to timothy. Mammoth clover should be used on such soils as the Hermon, Gloucester, and similar soils of high acidity which are wet in the spring and have a tendency to droughtiness in midsummer. Clover should be seeded with timothy, as this has been found to increase yields (*5*).

Oats are used mainly as a nurse crop for clover, timothy, or other grass crops, and they usually follow corn. It is advisable to seed the oats at a low rate and use phosphatic fertilizer to increase the grain yield and prevent lodging. Where manure is used on corn the amount of phosphate should be held down to 200 pounds an acre and should be increased on the following oat crop to 500 pounds an acre. The following clover and timothy crop will profit from this practice (*6*). The rate of seeding should depend on the productivity of the soil, that is, lower on good land than on poor land.

Buckwheat is not an important crop and can be and is grown with little preparation of the land. It fits anywhere in the rotation or can be grown with little or no regard to rotation. Ordinarily this crop should receive from 300 to 400 pounds of superphosphate to the acre. The Cornell Station, however, approves the use of 150 to 200 pounds of superphosphate for buckwheat if the preceding crop has received phosphate, and if the preceding two or three crops have received phosphate, buckwheat may be expected to succeed without the use of this fertilizer. On such soils as Dutchess, Bernardston, Hermon, and Woodbridge, buckwheat should be more extensively used in the rotations. On such soils as the Pittsfield, Cossayuna, and Hudson, where normally farmed, buckwheat can be grown as a catch crop with little fertilization.

Potatoes can be grown successfully and are grown for home use and local markets on nearly all the well-drained soils. The best success, however, may be expected on the Gloucester, Dutchess, Hermon, and Hoosic soils—at least the quality of the tubers grown on these soils is superior to the quality of those grown on the other soils. Next to these soils are the Cossayuna, Troy, and Claverack soils. For best results with potatoes on the soils of this county commercial fertilizers should be used in preference to manure, as many of the potato troubles of this section can be traced to the use of manure.

The Cornell Station advises the use of manure on the preceding crop, and the use of high-grade fertilizer (from 400 to 600 pounds an acre of 5–10–5) on the potato crop (*6*). If commercial grades of potatoes are expected, from 600 to 1,000 pounds should be used. Green Mountain and Irish Cobbler are suitable varieties of potatoes for the lighter and acid soils, such as the Gloucester and Hoosic, and White Rural and Russet are suited to the heavier and more limy soils, such as the Hudson and Stockbridge.

Many soils in this county have a high lime content in the substratum or unaltered parent material, but aside from the Pittsfield and Genesee soils practically all the soils need lime for the production of legumes, especially alfalfa. Many of the soils, such as the Cossayuna, Claverack, Hudson, and Copake, need lime to start alfalfa, but when the roots reach the limy substratum the crop usually grows successfully.

For growing market-garden crops, practically all the soils, with the exception of those in the bottom lands, need liberal fertilization and the yields, even on the bottom-land soils, are improved by the use of fertilizer. Commercial fertilizers are used to force market-garden crops on the Hudson River bottom lands below Albany.

That pasture land has not received the attention due to its importance in the agriculture of this section is evidenced by the encroachment of birch, white pine, and aspen on the land and the large amount of thorn apple, white cedar, blueberries, and such pests as *Spiraea*, sweetfern, cinquefoil, and sumac. In many pastures where this growth is kept down, such weeds as goldenrod, wild aster, devils-paintbrush, lady's tobacco, and plantain are common, nearly all of which attend a run-down condition of the land or a lack of fertility in the surface soil. The pasture grasses are mainly Rhode Island bent, poverty grass, sweet vernal, Kentucky bluegrass, and Canada bluegrass.

Unless improved by seeding and fertilizer, the present cover crop is a fair indicator of the fertility of the surface soil. Bluegrass is the most common grass, and in many places it is the dominant grass on the Hudson, Pittsfield, and Genesee soils; Rhode Island bentgrass is more plentiful on the Hermon, Woodbridge, and Gloucester soils; and sweet vernal is plentiful on the Bernardston and Stockbridge soils. Much poverty grass grows on the Dutchess and Nassau soils, and creeping bentgrass and fescue grow on nearly all the bottom-land soils, such as the Ondawa, Podunk, and Eel. Pastures on low areas contain much fescue, rushes, sedges, and cattails. Pastures on the Cossayuna, Troy, Albia, Boynton, Walton, Alps, and Culvers soils differ considerably, according to the treatment received. In many places poverty grass is dominant, although the fields contain considerable bentgrass and bluegrass. The Hoosic, Copake, Otisville, and Schodack soils are not strictly grass soils, and poverty grass usually prevails unless the land is improved.

The Cornell Station recommends the use of phosphatic fertilizer in the form of phosphate, superphosphate, basic slag, bone meal, or floats, and the seeding of legumes, preferably white clover, or the use of nitrogenous fertilizers where the sod contains little or no white clover or other legumes. Where bluegrass grows in this section, some clover is present in most of the pastures. Pastures should be improved, where not too much run down, by fertilization rather than by reseeding. Chain or flexible harrows should be used in the winter for dragging the pastures that contain many weeds. To improve pastures on highly acid soils, such as the Dutchess, Macomber, Nassau, and Gloucester, the use of small quantities of lime in addition to phosphate is advised (*6*).

Table 4 shows the pH values and the lime requirements for soils of the various series identified in Rensselaer County.

TABLE 4.—*pH values and lime requirements of the soils of Rensselaer County, N. Y.*

GROUP 1.—SOILS DEVELOPED LARGELY FROM GLACIAL TILL

Soil series	Drainage	Lime requirement	Approximate pH [1]		
			Surface soil	Subsoil	Substratum
Macomber	Good	Very high	3.5	4.5	
Hermon	do	do	4.5	5.5	6.0
Woodbridge	do	do	5.0	5.0	5.5
Dutchess	do	High	(2)	(2)	(2)
Gloucester	do	do	5.0	5.0	6.0
Bernardston	do	do	5.0	6.0	6.5
Nassau	do	do	(2)	(2)	
Cossayuna	do	Medium	5.5	6.5	7.0
Walton	do	do	5.5	6.0	7.0
Troy	do	do	5.5	6.0	6.5
Stockbridge	do	Low	6.0	6.5	7.5
Pittsfield	do	do	6.5	7.5	8.0
Culvers	Imperfect	High	4.5	5.0	6.5
Hermon (imperfectly drained phase)	do	do	(2)	(2)	(2)
Woodbridge (heavy-subsoil phases)	do	do	(2)	(2)	(2)
Albia	do	Medium	5.0	5.5	7.5
Boynton	do	do	5.0	5.5	8.5
Alps	do	do	5.5	7.5	9.0
Whitman	Poor	High	(2)	(2)	(2)
Mansfield	do	Medium	(2)	(3)	(4)

GROUP 2.—SOILS DEVELOPED LARGELY FROM GLACIAL-OUTWASH AND LAKE-LAID MATERIALS

Danby	Good	High	(2)	(2)	(2)
Hoosic	do	High to medium	5.0	6.0	6.5–7.0
Otisville	do	do	5.0	6.0	6.5
Copake	do	do	6.0	7.5	9.0
Schodack	do	do	6.0	6.5	8.5–9.0
Claverack	do	do	5.5	6.0	7.0
Hudson	do	Medium to low	6.0	6.5	8.5
Orono	Imperfect	do	6.0	6.5	8.5

GROUP 3.—SOILS DEVELOPED FROM ALLUVIUM

Ondawa	Good	Medium	(2)	(2)	(2)
Genesee	do	Low	(5)	(4)	(4)
Podunk	Imperfect	High to medium	(6)	(6)	(6)
Eel	do	Low	6.7	7.0	8.0
Saco	Poor	Variable	(7)	(7)	(7)

MISCELLANEOUS SOIL MATERIALS

Rough stony land	Good	High			
Rock outcrop	do	do			
Muck	Poor	do			
Peat	do	do			
Marsh	do	do			
Alluvial soils, undifferentiated	do	do			

[1] pH value determined by field tests and by the hydrogen-electrode method.
[2] Acid.
[3] Neutral.
[4] Alkaline.
[5] Neutral to alkaline
[6] Acid to neutral.
[7] Acid to alkaline.

AGRICULTURAL LAND CLASSIFICATION

Table 5 gives the soils by groups, 1 representing the best group. The group is based on general productivity plus capability of use from a cultural point of view. The approximate area and percentage cleared, for each group, is given. A brief description of each subgroup, covering topography, degree of stoniness, and drainage, all of which are factors in the economic use of the land, is set forth, together with a general statement of utilization.

TABLE 5.—*Soils of Rensselaer County, N. Y., grouped according to capabilities for present use*

Group	Proportion of county	Soil	Description	Utilization
	Percent			
1. Well-drained, smooth, productive soils. 80 percent cleared and used for farming.	20	Genesee loam	Alluvial soils; well drained, stone- and gravel-free; subject to occasional overflow.	Nearly all used for cultivated crops (including vegetables), mowing, and pasture.
		Genesee fine sandy loam		
		Ondawa loam		
		Ondawa fine sandy loam		
		Ondawa fine sandy loam, high-bottom phase.		
		Hudson silt loam	Level; developed from lacustrine deposits—silts, clays, and fine sands; stone- and gravel-free.	Nearly all used for crops (including mowings, vegetables, and fruits); pasture.
		Hudson fine sandy loam		
		Claverack fine sandy loam.		
		Pittsfield stony loam	Smooth or gently rolling; well drained; developed from till high in lime; contain stone and gravel.	General-farm crops associated with dairying; vegetables, fruit, and alfalfa.
		Stockbridge loam		
		Cossayuna gravelly loam.	Smooth or gently rolling; developed from till influenced by limestone; well drained; contain gravel but little stone.	
		Cossayuna gravelly loam, deep phase.		
		Hudson silty clay loam	Imperfectly drained; developed from lacustrine clays and silts; stone- and gravel-free.	Nearly all used for field crops, mowing, pasture, and vegetables.
		Orono silt loam		
2. Well-drained, smooth, fairly productive soils. 70 percent cleared and used for farming.	15	Bernardston loam	Smooth undulating to rolling surface relief; well drained; developed from deep till; contain little stone but much gravel.	Crops associated with dairying; potatoes.
		Walton gravelly loam		
		Troy gravelly loam		
		Troy gravelly loam, sandy phase.		
		Gloucester gravelly loam.[1]		
		Copake gravelly loam	Smooth surface; well drained; developed on terrace; stone-free but contain some gravel.	Crops associated with dairying, vegetables, fruits, and alfalfa.
		Copake fine sandy loam		
		Hoosic silt loam		
		Hoosic fine sandy loam, deep phase.	Smooth surface; well drained; stone- and gravel-free.	Market-garden and other crops.
		Hoosic fine sandy loam	Smooth surface; well drained; developed on terraces; contain no stone but much gravel.	Crops associated with dairying, vegetables, and fruit.
		Hoosic gravelly loam		
		Hoosic gravelly fine sandy loam.		
		Hudson fine sandy loam, rolling phase.	Hummocky, well drained, and gravel-free.	Mainly in pasture; some alfalfa.
		Eel silt loam	Bottom land containing no stone or gravel; imperfectly drained, subject to overflow.	Mowing and pasture.
		Podunk silt loam		

[1] Not so inherently productive as other soils of group with which it is placed, but otherwise possessing desirable features, for example, ease of cultivation and early maturity of crops—advantages for market vegetables and potatoes.

TABLE 5.—*Soils of Rensselaer County, N. Y., grouped according to capabilities for present use*—Continued

Group	Proportion of county	Soil	Description	Utilization
	Percent			
3. Soils of medium productivity. 45 percent cleared and used for farming.	12	Dutchess gravelly loam	Undulating to rolling; well drained; developed from till containing some stone.	Mainly mowing, pasture, and potatoes.
		Woodbridge gravelly loam.		
		Hermon loam		
		Boynton gravelly silt loam.	Smooth or gently undulating; imperfectly drained; developed from fairly heavy till; well-developed hardpan; contain little stone but much gravel.	Mowing, small grains, and pasture.
		Albia gravelly loam		
		Culvers gravelly loam		
		Alps gravelly silt loam		
		Woodbridge gravelly loam, heavy-subsoil phase.		
		Pittsfield stony loam, shallow phase.	Well-drained, comparatively shallow till containing some stone; smoothly rolling.	Used in a small way for leguminous crops for mowing; furnishes excellent pasture.
		Schodack gravelly loam	Hummocky, gravelly and excessively drained.	Pasture and to some extent for alfalfa and fruit.
		Schodack gravelly fine sandy loam.		
		Otisville gravelly sandy loam.		
		Hoosic loamy fine sand	Smooth; developed on terraces; well drained; contain no stone but much gravel.	Cultivated crops, vegetables, small grains, mowing, and fruit.
		Hoosic gravelly sandy loam.		
4. Soils of medium-low productivity. 20 percent cleared and used for farming.	20	Eel silt loam, low phase.	Bottom land; low, poorly drained areas free from stone and gravel; fairly productive when drained.	Mowing and pasture.
		Alluvial soils, undifferentiated.		
		Orono silt loam, dark-colored phase.	Depressions on terraces from silt and clay material.	Wooded or pasture.
		Danby gravelly sandy loam.	Hummocky; contains much gravel and little stone, excessively drained.	Pasture and to a limited extent for crops.
		Macomber slate loam	Shallow, mainly residual soils; smooth to rolling; well drained; developed from shale and slate; contain little stone.	Pasture and, to slight extent, mowing and small grains.
		Nassau shale loam		
		Dutchess slate loam		
		Dutchess gravelly loam, shallow phase.		
		Muck	Organic soil, partly digested.	To slight extent for vegetables; use largely potential.
		Saco silt loam	Low poorly drained soil with organic surface layer.	Use largely potential.
		Mansfield silty clay loam.	Occupies depressions on till; imperfectly to poorly drained; contains some stone.	Pasture.
5. Poor soils. 15 percent cleared and used for farming. Includes 5 percent nonagricultural land.	33	Woodbridge stony loam	Undulating to strongly rolling; well drained; stony; developed from till.	Pasture; some abandoned land and forest.
		Gloucester gravelly loam, stony phase.		
		Woodbridge stony loam, heavy-subsoil phase	Smooth, imperfectly drained, stony.	Pasture; much abandoned land.
		Hermon stony loam, imperfectly drained phase.		
		Hermon stony loam	Well drained, undulating, rolling, to strongly rolling; developed from till; stony above a height of 1,200 feet.	Mainly in forest.
		Dutchess slate loam, stony phase.	Shallow and stony	Forest and pasture.
		Hermon stony loam, shallow phase.		
		Macomber slate loam, shallow phase.		
		Nassau shale loam, stony phase.		

TABLE 5.—*Soils of Rensselaer County, N. Y., grouped according to capabilities for present use*—Continued

Group	Proportion of county	Soil	Description	Utilization
	Percent			
5. Poor soils. 15 percent cleared and used for farming. Includes 5 percent nonagricultural land.	33	Hudson fine sandy loam, broken phase.	Steep to broken; contains no stone or gravel.	Forest and pastures.
		Copake gravelly loam, broken phase.	Steep to broken; contain little or no stone but much gravel; well drained.	Do.
		Hoosic gravelly sandy loam, broken phase.		
		Hudson silty clay loam, broken phase.		
		Albia gravelly loam, broken phase.	Steep to broken; contains stone and gravel; seepy in places.	Do.
		Whitman stony loam	Low, poorly drained till areas.	Mainly in forest.
		Rough stony land	Steep, broken, stony land.	Do.
		Peat	Not classified.	
		Marsh		
		Made land		
		Rock outcrop		

CLASSIFICATION OF SOIL TYPES ACCORDING TO PRODUCTIVITY

Table 6 gives a classification of the soil types, according to productivity, for each of the important crops grown in Rensselaer County.

TABLE 6.—*Classification of soil types in Rensselaer County, N. Y., accor*

Soil type	Productivity rating according to—		Crop-productiv						
	Inherent productivity [1]	Current practices [2]	Corn for grain	Corn for silage	Oats	Rye	Buckwheat	Tame grass hay [4]	Leguminous hay [4]
	Grade no.	*Grade no.*							
Genesee loam	1[8]	1	80	90	80	80	70	90	100
	1[9]	3	50	70	60	60	50	60	60
Genesee fine sandy loam	1	1	(60(80)	70(90)	60(80)	70	50(70)	70(80)	60(80)
Stockbridge loam			50(80)	50(90)	60(90)	70	70(100)	50(80)	60(80)
Pittsfield stony loam [10]			50(80)	50(90)	60(90)	70	70(100)	40(70)	50(70)
Hudson silt loam			50(70)	50(70)	60(80)	70	50(60)	50(70)	50(70)
Hudson fine sandy loam			50(70)	50(70)	60(80)	70	50(60)	50(70)	50(70)
Ondawa fine sandy loam, high-bottom phase			40(60)	50(70)	50(80)	60	60(70)	50(70)	40(60)
Ondawa loam	1[8]	1	60	70	60	70	70	70	60
	5[9]	5	40	60	40	50	50	50	40
Ondawa fine sandy loam	1[8]	1	60	70	60	70	70	70	60
	5[9]	5	40	60	40	50	50	50	40
Claverack fine sandy loam	2	2	40(70)	40(70)	50(70)	70	50(60)	40(60)	40(60)
Cossayuna gravelly loam, deep phase		2	40(60)	40(70)	50(80)	60	60(80)	40(60)	40(60)
Cossayuna gravelly loam		2	40(60)	40(70)	50(80)	60	60(80)	40(60)	40(60)
Hudson silty clay loam		3	40(60)	40(60)	60(80)	70	50(60)	50(70)	50(70)
Hoosic silt loam		2	40(60)	40(60)	50(80)	60	50(70)	40(60)	40(60)
Orono silt loam	3	3	40(60)	50(60)	60(50)	60	50(60)	50(70)	40(60)
Troy gravelly loam		2	30(50)	30(60)	50(70)	60	40(70)	50(70)	50(70)
Walton gravelly loam		2	30(50)	30(60)	50(70)	60	40(70)	50(70)	50(70)
Bernardston loam [10]		2	30(50)	30(60)	50(80)	60	60(90)	50(80)	30(50)
Troy gravelly loam, sandy phase		2	30(50)	30(60)	50(70)	60	40(70)	50(70)	50(70)
Copake gravelly loam		2	40(60)	30(50)	50(70)	60	50(70)	40(60)	40(70)
Copake fine sandy loam		2	40(60)	30(50)	50(70)	60	50(70)	40(60)	40(70)
Hoosic fine sandy loam, deep phase		2	40(60)	40(60)	50(80)	60	50(70)	30(60)	40(60)
Hoosic gravelly loam	4	2	40(60)	30(50)	50(70)	60	50(70)	30(60)	40(50)
Hoosic gravelly fine sandy loam		2	40(60)	30(50)	50(70)	60	50(70)	30(60)	40(50)
Hoosic fine sandy loam		2	40(60)	30(50)	50(70)	60	50(70)	30(60)	40(50)
Hudson fine sandy loam, rolling phase		3	30(50)	40(60)	40(60)	60	40(60)	30(50)	50(70)
Eel silt loam	2 (drained) [8]	3	40	70	60	70	60	80	50(80)
	7 (undrained) [9]	7	20	30	40	-----	40	60	30
Podunk silt loam	2 (drained) [8]	3	40	70	60	70	60	80	50(80)
	7 (undrained) [9]	7	20	30	40	-----	40	60	30

Gloucester gravelly loam [10]	5	3	20(40)	20(50)	50(70)	60	40(70)	40(60)	40(60)
Dutchess gravelly loam		3	30(50)	30(60)	50(70)	60	50(80)	30(50)	30(50)
Boynton gravelly silt loam		3	20(40)	30(60)	50(70)	60	50(80)	50(70)	40(60)
Albia gravelly loam		4	30(50)	40(60)	40(60)	60	50(70)	50(70)	40(60)
Culvers gravelly loam [10]		4	20(40)	30(60)	40(60)	60	50(70)	50(70)	40(60)
Woodbridge gravelly loam [10]		3	20(40)	20(40)	40(70)	60	40(60)	40(60)	40(60)
Alps gravelly silt loam		4	20(40)	30(60)	40(60)	60	50(70)	50(70)	40(60)
Woodbridge gravelly loam, heavy-subsoil phase [10]		3	20(40)	20(40)	40(70)	60	40(60)	40(60)	40(60)
Pittsfield stony loam, shallow phase [10]	6	4	20(50)	40(60)	40(60)	40	40(60)	30(40)	40(50)
Schodack gravelly loam		4	20(40)	30(50)	40(60)	50	30(50)	40(50)	40(60)
Schodack gravelly fine sandy loam		4	20(40)	30(50)	40(60)	50	30(50)	40(50)	40(60)
Hermon loam [10]		4	30(40)	30(50)	40(60)	40	40(60)	40(60)	30(40)
Dutchess gravelly loam, shallow phase		4	30(40)	30(50)	50(60)	50	50(70)	30(50)	20(40)
Hoosic gravelly sandy loam		5	20(50)	40(60)	40(60)	60	40(60)	30(50)	20(50)
Otisville gravelly sandy loam		4	20(30)	30(40)	30(50)	50	40(50)	30(50)	20(40)
Hoosic loamy fine sand		5	20(50)	30(60)	30(50)	50	30(60)	30(50)	20(40)
Eel silt loam, low phase	2 (drained) [8]	3	40—	60—	50—	50	60—	80—	50
	9 (undrained) [9]	9						40	30
Alluvial soils, undifferentiated	3 (drained) [8]	3	40	60	60	50	50	70	50
	9 (undrained) [9]	9						20	
Orono silt loam, dark-colored phase	3 (drained)	3	40	60	60	50	50	60	40
	9 (undrained)	9						30	
Muck	3 (drained)	3	40	60	60	50	50	60	40
	10 (undrained)	10						10	
Dutchess slate loam	7	6	20(30)	30(40)	40(50)	30	40(50)	30(50)	10(20)
Danby gravelly sandy loam			10—	20(30)	30(50)	50	40(50)	30(50)	20(30)
Macomber slate loam			10—	20(30)	40(50)	30	40(50)	30(50)	10(20)
Nassau shale loam			20(30)	30(40)	40(50)	30	40(50)	30(50)	10(20)
Mansfield silty clay loam	6 (drained)	5	30	50	50	40	50	50	20
	9 (undrained)	9					10	20	10
Saco silt loam	6 (drained) [8]	5	30	40	50	40	40	60	40
	9 (undrained) [9]	9						10	
Woodbridge stony loam [11]	8	7	10(20)	20(30)	20(30)	20	20(30)	30(40)	30(40)
Gloucester gravelly loam, stony phase [11]		7	10(20)	30(40)	20(30)	20		20(30)	20(30)
Hermon stony loam [11]		8	10(20)	10(20)	10(20)	20	20(30)	20(40)	20(40)
Woodbridge stony loam, heavy-*subsoil* phase [11]		8		10—	20—	20	20—	30(40)	20(30)

[1] Soil types having the highest general productivity in the county are rated grade 1. When two inherent productivity rat
number when the land is drained, or protected from flood, and the lower figure refers to the grade number when the land is undr

[2] This grade number gives the comparative productivity, according to current farm *practices of* management, on the various

[3] Soil types inherently most productive for the specified *crop in* the United States =100. Only those inherently most produc
the standard. Unusually *productive* soils of limited acreage rate above 100. Figures in parentheses indicate the productivity ac
include the use of soil amendments as lime, fertilizers, and manure.

[4] In the case of items such as tame-grass hay, leguminous hay, vegetables, small fruits, melons, and tree fruits, which include
productivity of the soil type for that member of the group best adapted to the soil type in question. Thus, *soil* types well adapt
for tree fruits, although their adaptability to peaches or other fruits *may* be poor. Timothy and red clover were the principal
leguminous hay, respectively; apples were used for tree fruits.

[5] Vegetables doing best on highly organic soils; e. g., onions, celery, lettuce.

[6] Vegetables not requiring highly organic soils.

[7] Only a general comparative rating for forest for the county is given. Order of preference is A, B, C.

[8] Land with optimum protection from overflow.

[9] Land with no protection from overflow.

[10] Moderately hilly or stony land, not very erosive, but not well adapted to farm machinery.

[11] Steep or stony land, on which tillage is extremely difficult.

TABLE 6.—*Classification of soil types in Rensselaer County, N. Y., according to pr*

Soil type	Productivity rating according to—		Crop-productiv						
	Inherent productivity	Current practices	Corn for grain	Corn for silage	Oats	Rye	Buckwheat	Tame grass hay	Leguminous hay
	Grade no.	*Grade no.*							
Dutchess slate loam, stony phase [10]	9	9	-------	-------	20	20	20	20(30)	20(30)
Hermon stony loam, shallow phase [11]		9	-------	-------	10	10	10	20(30)	20(30)
Hermon stony loam, imperfectly drained phase [11]		9	-------	-------	-------	-------	-------	30(40)	20(30)
Macomber slate loam, shallow phase		9	-------	-------	-------	-------	-------	20(30)	20(30)
Nassau shale loam, stony phase [10]		9	-------	-------	-------	-------	-------	20(30)	20(30)
Hudson silty clay loam, broken phase		10	-------	-------	-------	-------	-------	-------	-------
Hudson fine sandy loam, broken phase		10	-------	-------	-------	-------	-------	-------	-------
Copake gravelly loam, broken phase		10	-------	-------	-------	-------	-------	-------	-------
Albia gravelly loam, broken phase		10	-------	-------	-------	-------	-------	-------	-------
Hoosic gravelly sandy loam, broken phase		10	-------	-------	-------	-------	-------	-------	-------
Whitman stony loam [11]	10	10	-------	-------	-------	-------	-------	-------	-------
Rough stony land			-------	-------	-------	-------	-------	-------	-------
Peat, undrained			-------	-------	-------	-------	-------	10	-------
Marsh			-------	-------	-------	-------	-------	-------	-------
Made land			-------	-------	-------	-------	-------	-------	-------
Rock outcrop			-------	-------	-------	-------	-------	-------	-------

[10] Moderately hilly or stony land, not very erosive, but not well adapted to farm machinery.
[11] Steep or stony land, on which tillage is extremely difficult.

This classification compares the inherent productivity of each of the soil types in the county for a given crop, to a standard, namely, the soil type (or types) with a significant acreage inherently most productive in the United States for that crop. This most productive soil type in the United States for a given crop is given a productivity index of 100 for that crop, which is called the base index and is the standard with which the productivity of all other soil types for that crop is compared. Therefore, a soil type estimated to be about half as productive for that crop as the best in the United States receives an index of 50. In a few instances small, areally unimportant areas of productive soils will carry, necessarily, an index above 100 for a specified crop. The inherent productivity indexes are based on the ability of the land to produce under a management capable of maintaining the inherent or natural level of productivity.

In addition to productivity indexes for each important crop, each soil type is assigned a general-productivity rating or grading of agricultural quality. The soil types having the highest average productivity indexes in the county are given the rating or grade of 1 for that county, the soil types having the next highest the grade of 2, and so on. The soil types falling in the same grade are listed in the table in the order of highest average inherent-productivity indexes.

In the determination of this general-productivity grade, more weight is given to productivity of the important staple crops than of minor crops. These values indicate, as nearly as possible, the inherent or natural productive capacity of the soil types, regardless of such important considerations as differences due to previous management and the accessibility of markets.

Obviously the inherent or natural productive capacity of land means the productivity without the repeated use of amendments. Yields obtained through the use of amendments, as lime, water, and fertilizer, do not indicate well the inherent productivity. However, some soil types, although low in inherent productivity, are responsive to the application of amendments and produce good yields or high quality of product. Because the index of inherent productivity does not express the responsiveness of soil types to fertilizer, a second index is used (in parentheses) to compare the productive capacity of a given soil type under the amendment practices where it occurs with the inherently most productive soil type in the United States for that crop. Thus the same standard of reference is used as for the inherent crop-productivity index. This second index (in parentheses) compares what may be expected in the way of yield and quality of product from different soil types under current practices of culture. Quality of product average being equal, it would be approximately the same as a comparison of average yield of product. This index is used only where amendments are added to the land as a common practice.

A second general-productivity rating is assigned (in column 3) to the soil types to indicate their relative productivity in the county under current practices of management. This rating is determined in the same general manner as the productivity rating for inherent productivity. In the case of those soil types which are not amended under practices of current management, the inherent-productivity rating is the basis of the productivity rating according to current practices.

The factors influencing the productivity of land are mainly those of climate, soil, and surface configuration. All are considered in the determination of the productivity indexes, and a low index for a particular crop may as likely be due to an unfavorable climate or surface configuration as to fertility of soil. Surface configuration is important mainly on account of its influence on the amount of water which penetrates the soil and on erosion. It is of course also a secondary factor that helps to determine the character of both climate and soil.

In the case of soil types with poor natural drainage, two series of indexes are given, one applying to the soil types with no artificial drainage, and the other to soil types to which optimum artificial drainage has been applied. In many instances some artificial drainage, but not the optimum, has been applied to poorly drained lands so that their inherent productivity under optimum drainage is not realized.

In the case of bottom land subject to periodic overflow, two sets of indexes are given, one applying to the land when it receives optimum protection from overflow, the other to the land with no such protection. This double series of indexes is used to indicate the potential inherent productivity in addition to the present inherent productivity of poorly drained or overflow lands.

The cost or difficulty of effecting drainage or protection from overflow plays no part in the potential inherent-productivity rating of such lands. Two kinds of soil having the same productivity when drained are rated the same, although optimum artificial drainage may cost 10 times as much on one as on the other.

It must be stated clearly that this classification is not to be interpreted directly into specific land values. The intention is to confine attention to essentially permanent factors of inherent productivity and not to include transitory economic considerations. In some instances the information on which to base the rating is not so complete as desired; in these cases further study may suggest changes.

SOILS AND THEIR INTERPRETATION

The soils of Rensselaer County lie in two soil regions, or provinces, and, owing to the physiography, these two divisions are well defined. The well-drained upland, or normal, soils of the Hudson Valley, or lowland plateau, belong to the Gray-Brown Podzolic group; and those of the Rensselaer Plateau and Taconic Mountains, both high sections, belong to the true Podzol group. The soils of neither region are leached to the extent of the Red and Yellow soils of the South Atlantic States. The climatic conditions under which the soils of the high region are developed allow the accumulation, under forest conditions, of a thick layer of duff upon the forest floor, and the soils of the lowlands have a thin mantle of organic matter more or less mixed with the soil material.

The entire region was glaciated, and most of the bedrock is covered with a mantle of till which ranges from a mere film to 100 feet in thickness. Fairly large areas of soil are developed from essentially residual material weathered from rocks in place. The glacial material is modified in places and buried in others by outwash consisting in most places of sandy and gravelly material, and in other places

of lake-laid clayey and silty material. The sandier soils on the terraces have suffered more from eluviation than any other soils in the county, and they approach the condition of the soils in the Long Island and New Jersey coastal-plain area. The alluvial soils on the present flood plain, which are very young, have suffered little or no eluviation. Other factors, such as the depth of deposits; whether the deposits are glacial outwash, lacustrine, or alluvial; character of substratum material and surface relief, both affecting drainage; and erosion are modifying factors in determining the ultimate soil, as well as the character and origin of the parent material, in soils as young as many of those in the glacial region, most of which are much younger than the soils south of the glacial belt, developed from residual material. A brief outline of the rock formations which outcrop over the area is necessary to a full understanding of the soil materials. Some of the rocks are harder and more resistant than others, and they are responsible geologically for the differences in the physiographic regions, to a great extent for the general surface relief, and also for the rock content of the soils of certain sections.

The bedrock under that part of the county lying west of the north and south center line consists of soft yellow and gray shales (Hudson River shales) interspersed with beds of calcareous sandstone and thin limestone. East of this line the bedrock passes successively from shale to slate and into schist (Berkshire schist), interspersed with fairly large bodies of calcite limestone, which is responsible for the valleys of the region. In the south-central part of the county is an area covering about one-third of the total area of the county, in which the outcrop on the surface is highly metamorphosed sandstone and conglomerate interspersed with schist, known as the Rensselaer grit formation.[4]

The surface soils of the Gray-Brown Podzolic soils in general are low in phosphorus. Exceptions to this occur in certain soils which have been developed from parent materials high in phosphorus. The Maury soils of the limestone basin of Kentucky and Tennessee have a content as high as 0.3 percent P_2O_5 in the surface soil and 0.9 percent P_2O_5 in the substratum. The McAfee soils of Kentucky analyze 1 percent P_2O_5 in the surface soil and 2 percent P_2O_5 in the substratum. It is doubtful that the parent material of the soils of this section, with one or two exceptions, will be found to contain noticeable amounts of P_2O_5. No analyses are available, except of Becket loam from Berkshire County, Mass., set forth in table 7. These analyses are fairly representative of the soils of the Rensselaer Plateau.

TABLE 7.—*Phosphorus content in samples of Becket loam, one-half mile west of Washington, Berkshire County, Mass.*

Description	Depth	P_2O_5
	Inches	*Percent*
Humus	0- 6	0.13
Bleicherde	6-11	.04
Orterde	11-24	.08
Parent material	24-36	.08

[4] For further information on the geology of Rensselaer County see New York State Museum Bull. 285 (*12*), U. S. Geological Survey Bull. 272 (*2*), and U. S. Geological Survey Bull. 744 (*3*).

In a region of true Podzol soils, from which this sample came, and also in the soils of the Rensselaer Plateau, where organic matter has a tendency to accumulate on the surface, the surface soils are higher in phosphorus than soils where the organic matter is more easily dispersed and erosion is more active. The soils of the Hudson Valley fall in this latter class, and even where the parent material contains a higher percentage of P_2O_5, the surface soils are deficient in this element to a marked degree.

The soils of this county are many, and they are differentiated on soil characteristics which have resulted largely from differences in parent material, degree of development, and drainage. Some of the more important differences are described in the following pages.

The profile of the principal soil of the Cossayuna series is typical of the normal soil developed in the Hudson Valley, or Hudson lowland belt. A description of a profile of Cossayuna gravelly loam, as observed 1½ miles north of Valley Falls, follows:

0 to 1 inch, white pine needles and hard maple leaves over heavy greasy decomposed organic matter (greasy mull) with some dark-colored soil material below.
1 to 3 inches, dark-brown mellow heavy loam with a fine-granular structure.
3 to 12 inches, yellowish-brown friable gravelly loam with a single-grain structure or structureless.
12 to 24 inches, yellowish-brown or yellow fine but friable loam.
24 to 40 inches, greenish-yellow gritty till which is moderately compact but friable.
40 inches +, greenish-gray gritty highly compact till.

This soil is developed from glacial till consisting of a mixture of shale, sandstone, quartz, limestone, and calcareous sandstone, with the shale and calcareous sandstone predominating. The till averages 10 feet in thickness. The vegetation includes white pine, red oak, and hard maple. The surface relief is rolling, and drainage is good.

The soils of the Troy series have a profile arrangement similar to that of the Cossayuna soils. The Troy soils are developed from tightly compact glacial till of the same parent material as the Cossayuna. The soils occupy high-crowned drumlins having well-established drainage, and the soil material contains no mottling. The Albia soils are developed from similar material and occupy similar positions, but they have slightly more subdued relief than the Troy soils. This allows for slight retardation of the downward movement of moisture, resulting in the development of a mottled zone several inches thick in the Albia soils, at a depth of about 2 feet below the surface or just above the compact zone. The Boynton soils have developed from much the same material which is slightly heavier in some places and in others has been subjected to less leaching. These soils occupy low smooth hills which, together with the compact subsoil, retard drainage to a greater degree than in the Albia soils. This has resulted in an arrested development, which is attested by the mottled zone occurring at a depth ranging from 12 to 15 inches and the high lime content below a depth of 20 inches. In other soils developed from similar material, the mottled zone lies much deeper.

Following is a description of a profile of Boynton gravelly silt loam, as observed in a pasture 1½ miles east of Boyntonville. The soil at this place occupies low smooth hills, and drainage is imper-

fect. The original forest consisted of hardwoods and white pine, but much alder is in the second growth.

0 to 4 inches, dark-brown mellow silt loam with a granular structure.
4 to 12 inches, yellowish-brown gravelly silt loam which has a fairly firm single-grain structure.
12 to 36 inches, bluish-gray massive and compact silty clay loam mottled with brown.
36 to 60 inches, bluish-gray till with a silty clay loam texture, containing much slate gravel. The structure is massive, with irregular angular breakage. The material is tightly compact and strongly alkaline, effervescing with hydrochloric acid.

The Pittsfield soils are derived from till containing a high percentage of calcite limestone. They have a friable subsoil and substratum. Field tests show a neutral surface layer and an alkaline reaction below a depth of 6 or 8 inches. The material below a depth ranging from 24 to 36 inches effervesces strongly with hydrochloric acid.

The Stockbridge soils are developed from a mixture of slate and limestone. They have a compact subsoil and substratum. These soils are not so alkaline as the Pittsfield soils but have alkaline subsoils. The good drainage is due to the high-crowned or drumlin form. Pastures on both the Pittsfield and Stockbridge soils support a heavy growth of brushy cinquefoil, but most of the pastures throughout the county contain *Spiraea*, or steeplebush.

The Culvers soils are developed from weathered red shale accumulated by glacial action. The total depth of soil material is about 24 inches.

The Alps soils are developed from glacial drift derived from red calcareous shales, in which, owing to the heaviness and compaction of the parent material, development has taken place to a comparatively slight depth. The compactness of the subsoil results in surface drainage only, and this has caused much sheet and gully erosion, even on soils which have comparatively smooth surface relief.

The Gloucester soils are characterized by their stony surface soils and comparatively loose substrata. This condition results in excessive drainage. These soils are developed largely from the grit formation which is responsible for their stoniness.

The Nassau soils are developed from residual materials weathered in place from the soft shales. Under cultivation, erosion has removed most of the surface soil, so that at present, with the exception of a few spots of shallow glacial drift, the material over the shale ranges from a mere film to about 7 inches in thickness.

The Dutchess soils are developed from slate and schist. They are comparatively thin but not so thin as the Nassau soils. The Bernardston soils have developed from deeper glacial till material derived from slate and schist. Both the Dutchess and Bernardston soils are well drained. Owing to the character of the parent material they are highly acid.

The Mansfield soils represent the poorly drained soils developed mainly from shales, slates, and schist. They occupy low positions.

The soils developed on the outwash plains, terraces, and lake-laid materials, have profiles similar to the soils of the Hudson lowlands, but they differ widely in the class of material from which they are

derived. These soils, with the exception of those of one series, are well drained. The original tree growth consisted mainly of white pine and oak, together with scattered birch and aspen. The Hoosic soils are derived from slate, shale, and sandstone, and they have smooth surface relief. The following description is of a profile of Hoosic gravelly sandy loam and is representative of the soils developed from this class of outwash material. The area in which this profile was observed is 1 mile northwest of Schaghticoke, on a terrace 300 feet above sea level and 200 feet above the nearby stream level, in an abandoned field grown up to broomsedge, lady's tobacco, goldenrod, and moss. The surface relief is that of a smooth terrace, and drainage is excessive. The original forest was white pine and oak, and the second growth includes white birch, white pine, and red oak. Gray birch and brown birch have come up in old fields.

0 to ½ inch, vegetable mold derived from moss, lady's tobacco, and broomsedge.
½ to 7 inches, brown gravelly sandy loam which is mellow and structureless.
7 to 15 inches, yellowish-brown gravelly sandy loam which is slightly firm but friable and mellow.
15 to 26 inches, mixed gray and brown quartz and shale gravel containing some sandy and loamy material and tarnished by weathering.
26 to 48 inches +, mixed shale, slate, and quartz gravel containing no calcareous material in the substratum within a depth of 8 feet.

The wide textural differences in the Hoosic soils are due mainly to the character of the original deposit.

The Copake soils differ from the Hoosic only in having calcareous gravel or gravel coated with carbonates at a depth ranging from 6 to 10 feet below the surface. That is, the parent material of the Copake soils contains more lime than that of the Hoosic soils.

The soils of the Otisville and Schodack series are developed on kames and eskers and have a typically hummocky surface relief. The profiles are similar to those of the Hoosic and Copake soils, respectively. As they have broken surface relief, these soils are excessively drained.

The Hudson soils owe their origin to an entirely different class of material. They are developed from silt, clay, and fine sand of lacustrine origin. These soils originally supported a heavy hardwood forest. Following is a description of a profile of Hudson silt loam, as observed 1¼ miles northwest of Speigletown, in an old meadow. The original tree growth consisted of hardwoods, including white oak, red oak, elm, hickory, butternut, ash, and hard maple. The surface relief is level, and drainage is good.

0 to 7 inches, light-brown or grayish-brown granular mellow silt loam.
7 to 12 inches, brown granular mellow silt loam.
12 to 17 inches, brownish-yellow or grayish-brown fairly compact silt loam.
17 to 44 inches, brownish-yellow, with faint gray mottling, silty clay loam which is compact and has irregular angular breakage.
44 to 60 inches +, alternate beds of silty very fine sand and clay, ranging from greenish yellow and yellow to brown and reddish brown in color, underlain by bluish-gray massive clay at a depth of 10 feet. This material effervesces with hydrochloric acid.

The textural differences in the soils of the Hudson series, including fine sandy loam, silt loam, and silty clay loam, are due to differences in the texture of the original deposits. The silty clay loam, owing to its heaviness, has resisted weathering and eluviation to a greater extent than the silt loam or fine sandy loam.

The Orono soils are derived from the same class of material as the Hudson soils, but they occupy flats and depressions, which are imperfectly drained because of the surface relief and heavy substratum, thereby allowing the accumulation of organic matter on the surface and mottling in the subsoil.

The Claverack soils have merely a thin deposit of sandy or gravelly material over the lacustrine deposits. The surface soil ranges in thickness from about 2 to 5 feet. The clay substratum holds moisture to the extent that faint gray mottling is common just above the clay stratum.

The soils of the present flood plains are recent-alluvial soils and have young soil profiles that have not been subjected to leaching and have, therefore, lost little of their original salts or colloidal material. The separations are based largely on the parent material and the degree of drainage. The Ondawa and Genesee soils represent the soils of the well-drained bottoms. The Ondawa are acid and the Genesee alkaline. The Eel soils are imperfectly drained. The low phase of the Eel soils and the Saco soils are poorly drained, the Saco consisting of much heavier and more plastic material than the Eel and occurring under swampy conditions. Alluvial soils, undifferentiated, include soils ranging widely in texture and drainage, but, in general, all the land under this classification is poorly drained.

The soils of the Rensselaer Plateau and Taconic Mountain section lie at an elevation ranging from 1,600 to 2,500 feet above sea level, with the greater part lying between 1,500 and 1,800 feet. The elevation, together with the higher rainfall, allows the accumulation of organic matter as a mat on the surface, especially under a coniferous forest growth which is fostered by this high elevation. Besides spruce, hemlock, and pine, the forest growth is mostly oak, birch, beech, and hard maple.

The soils of the Hermon series occupy a larger area than any other soils of this higher region and are representative of the true Podzol soils of the North.

Following is a description of a profile of Hermon loam, on the Rensselaer Plateau, at an elevation of 1,500 feet above sea level. This area occupies a smoothly rolling or gently sloping hilltop, with a slope of approximately 7°. The forest growth includes mainly hemlock, with a scattering of beech, rock maple, yellow birch, and white birch. Spruce is abundant on flats at a slightly higher elevation, and red oak and white oak at lower elevations.

0 to 1 inch, mainly coniferous leaves, highly acid.
1 to 4 inches, brown organic matter.
4 to 6 inches, gray fine sandy loam with a mellow single-grain structure. The material is highly acid in reaction.
6 to 12 inches, brown mellow loam having a single-grain structure, firm but friable, and the upper part somewhat fluffy. The material is highly acid.
12 to 20 inches, yellowish-brown firm but friable loam having a single-grain structure.
20 to 48 inches, yellowish-gray sandy loam with a single-grain structure. The material is slightly compact in place and is indurated on drying. It is acid in reaction.
48 to 60 inches, gray or greenish-gray gritty sandy loam till, which is fairly compact in place but is friable when broken down.

The Macomber soils are developed almost exclusively from slates and schist weathered in place, together with comparatively shallow deposits of glacial drift developed from the same material. They have a true Podzol profile developed in a shallow soil. In general they are free from stone, and, aside from the surface layers, are similar to the Nassau soils or to soils previously mapped as a shallow phase of the Dutchess soils. They support more yellow birch, white birch, and chestnut oak than the other soils of this high region.

Table 8 gives the results of pH determinations of two Podzol soils of Rensselaer County, N. Y., and of two Podzol soils from Massachusetts for comparison. These determinations were made in the laboratories of the Bureau of Chemistry and Soils by the hydrogen-electrode method.

TABLE 8.—*pH determinations of 2 Podzol soils from Rensselaer County, N. Y., and of 2 from Massachusetts*

Soil type and sample no.	Location	Horizon	Depth	pH
Hermon loam:			*Inches*	
1644117	½ mile west of Dyking Pond, Rensselaer County, N. Y.	Humus	0–2	4.0
1644118		Gray	2–3	4.6
1644119		Brown	3–15	5.2
1644120		Light brown	15–32	5.9
1644121		Parent material	32–48	6.2
Macomber slate loam:				
1644198	2 miles southeast of Cherryplain, Rensselaer County, N. Y.	Humus	0–1	3.6
1644199		do	1–5	3.4
1644200		Gray	5–6½	3.5
1644201		Brown	6½–9	3.9
1644202		Light brown	9–15	4.5
1644203		Parent material	15–20	4.7
Becket loam:				
131170	1½ miles west of West Blandford, Hampden County, Mass.	Raw humus	0–4	4.4
131171		Bleached	4–6	4.1
131172		Brown	6–7	4.2
131173		Lighter brown	7–15	4.4
131174		Light brown	15–24	4.6
131175		Light gray brown	24–28	4.8
Becket fine sandy loam:				
1307145	1½ miles northeast of Becket, Berkshire County, Mass.	Raw humus	0–2	3.8
1307146		Bleached	2–3	4.2
1307147		Dark coffee brown	3–4	4.1
1307142		Light coffee brown	6–20	5.0
1307143		Light brown	20–24	5.1
1307144		Light gray brown	24–36	5.6

The soils of the Woodbridge series are differentiated from the Hermon soils mainly because of the heavier and more compact character of their subsoil and substratum, owing to the origin of the parent soil material. The Woodbridge soils are developed from a mixture of the grit formation with some shale, and they contain much stone and gravelly material. The till deposits from which the Woodbridge soils are developed are deeper than those from which the Hermon soils are developed. The forest on the Woodbridge soils contains more red oak and white oak than does that on the Hermon soils.

The Danby soils are Podzols and are developed from kame formations consisting of extremely loose gravelly and sandy deposits containing few stones. They have a decidedly hummocky surface relief, and drainage is excessive. More white pine, gray birch, and aspen grow on the land than is common in this high region.

The Whitman soils are imperfectly or poorly drained, as they occupy somewhat flat or depressed areas. This accounts for the dark surface soil and mottled gray and brown condition of the subsoil and substratum. Spruce, hemlock, arborvitae, and alder are common trees on these soils.

Muck consists of comparatively shallow areas of organic matter fairly well digested and mixed with mineral soil, and peat is brown raw fibrous peat.

Table 9 gives the results of pH determinations of a number of soils from Rensselaer County. These determinations were made in the laboratores of the Bureau of Chemistry and Soils by the hydrogen-electrode method.

TABLE 9.—*pH determinations of several soils from Rensselaer County, N. Y.*

Soil type and sample no.	Depth	pH
Dutchess slate loam:	*Inches*	
1644198	0 - 1	3.6
1644199	1 - 5	3.4
1644200	5 - 6½	3.5
1644201	6½- 9	3.9
1644202	9 - 15	4.5
1644203	15 - 20	4.7
Woodbridge gravelly loam:		
1644216	0 - 6	5.1
1644217	6 - 20	4.6
1644218	20 - 48	5.1
Albia gravelly loam:		
1644223	0 - 1	5.5
1644224	1 - 4	4.8
1644225	4 - 8	5.4
1644226	8 - 24	5.5
1644226½	24 - 36	5.5
1644227	36 - 96	7.6
Boynton gravelly silt loam:		
164477	0 - 4	5.2
164478	4 - 12	5.2
164479	12 - 36	5.5
164480	36 - 60	8.6
Alps gravelly silt loam:		
164493	0 - 7	5.6
164494	7 - 15	5.7
164495	15 - 24	7.4
164496	24 - 46	9.1
164497	46 - 60	9.1
Hudson fine sandy loam:		
164490	0 - 3	5.7
164491	3 - 10	6.2
164492	10 - 20	6.4
164492a	20 - 36	6.7
164492b	36 - 48	7.8
164492c	48 - 72	8.9
164492d	72 -120	8.5
Hermon loam:		
1644117	0 - 2	4.0
1644118	2 - 3	4.6
1644119	3 - 15	5.2
1644120	15 - 32	5.9
1644121	32 - 48	6.2
Cossayuna gravelly loam, deep phase:		
164411	0 - 1	5.3
164412	1 - 3	5.3
164413	3 - 12	5.5
164414	12 - 24	5.8
164415	24 - 40	6.5
164416	40+	6.8
Hoosic gravelly sandy loam:	*Inches*	
164406	0 - ½	5.8
164407	½- 7	6.0
164408	7 - 15	6.3
164409	15 - 26	7.1
164410	26 - 48+	7.2
Troy gravelly loam:		
164417	0 - 3	5.5
164418	3 - 8	5.8
164419	8 - 22	5.9
164420	22 - 40	6.1
Schodack gravelly loam:		
164429	0 - 6	6.2
164430	6 - 15	6.3
164431	15 - 24	6.5
164432	24 - 36	6.5
164433	36 - 72	6.8
164434	72 -180	9.1
Hudson silty clay loam:		
164445	0 - 6	6.2
164446	6 - 15	5.9
164447	15 - 36	6.3
164448	36+	8.8
Copake gravelly loam:		
164449	0 - 7	7.9
164450	7 - 20	6.8
164451	20 - 36	7.1
164452	36 - 60	7.5
164453	60 - 96	7.5
164454	96 -120+	9.9
Culvers gravelly loam:		
1644136	0 - 2	5.6
1644137	2 - 7	5.3
1644138	7 - 15	5.8
1644139	15 - 24	6.0
1644140	24 - 60	6.3
1644141	60+	7.2
Otisville gravelly sandy loam:		
1644153	0 - 5	5.9
1644154	5 - 14	5.9
1644155	14 - 24	6.2
1644156	24 - 32	6.5
1644157	32 - 48	6.5
1644158	48 -120	8.3
Bernardston loam:		
1644175	0 - 2	5.3
1644176	2 - 6	5.3
1644177	6 - 12	5.6
1644178	12 - 24	6.1
1644179	24 - 48	6.7
1644180	48 -120	6.7

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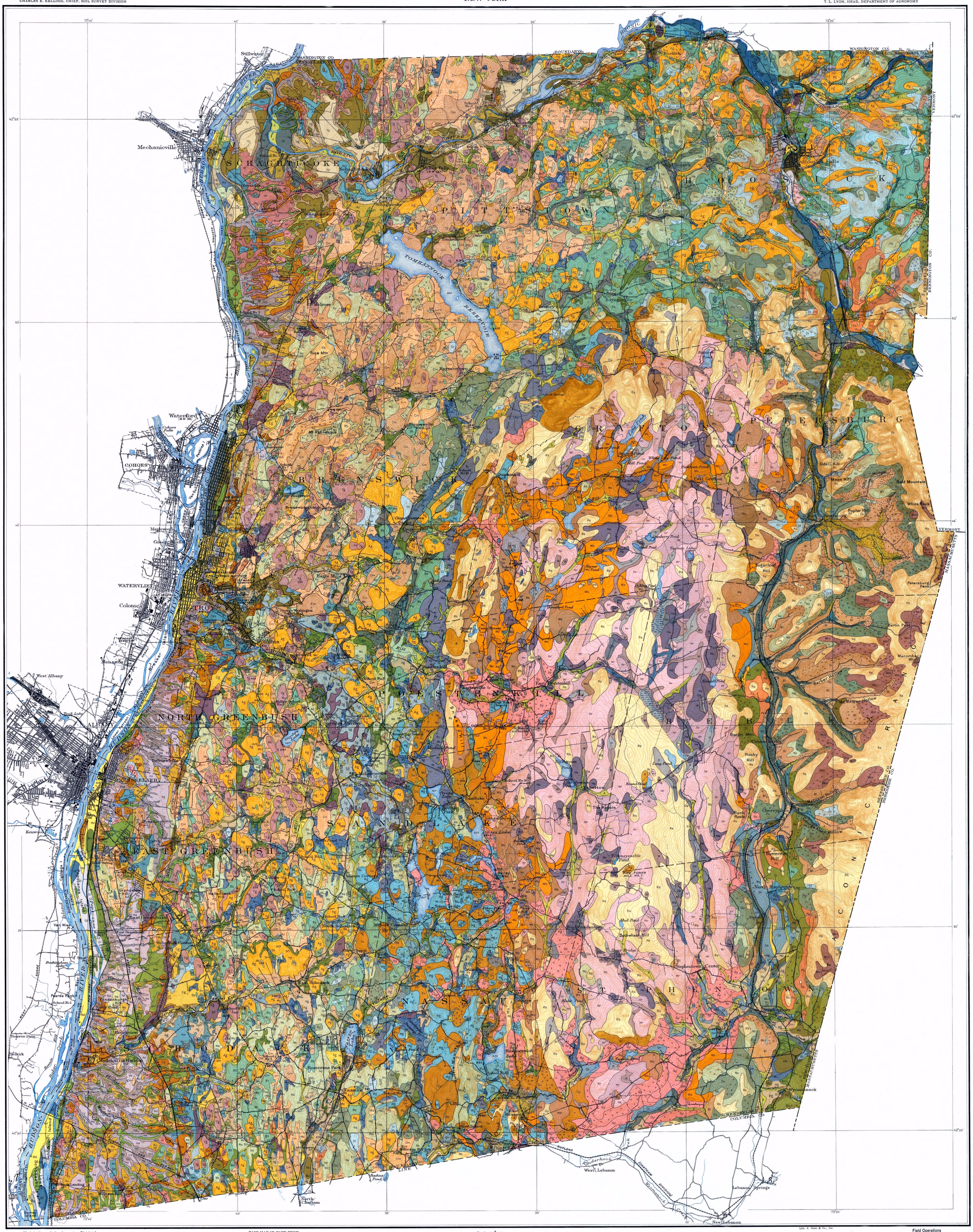
U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
CHARLES E. KELLOGG, CHIEF, SOIL SURVEY DIVISION

SOIL MAP
RENSSELAER COUNTY
NEW YORK

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION
C. E. LADD, DIRECTOR
T. L. LYON, HEAD, DEPARTMENT OF AGRONOMY



LEGEND

- Albia gravelly loam — Ag
- Broken phase — Ag
- Alps gravelly silt loam — Ay
- Bernardston loam — Bl
- Boynton gravelly silt loam — Bs
- Claverack fine sandy loam — Cs
- Copake fine sandy loam — Cf
- Copake gravelly loam — Cg
- Broken phase — Cg
- Cossayuna gravelly loam — Cm
- Deep phase — Cm
- Culvers gravelly loam — Cu
- Danby gravelly sandy loam — Da
- Dutchess slate loam — Dl
- Stony phase — Dl
- Dutchess gravelly loam — Du
- Shallow phase — Du
- Eel silt loam — Ea
- Low phase — Ea
- Genesee fine sandy loam — Gf
- Genesee loam — Gl
- Gloucester gravelly loam — Gy
- Stony phase — Gy
- Rock outcrop — R
- Alluvial soils (*Undifferentiated*) — A
- Hermon stony loam — Hr
- Shallow phase — Hr
- Imperfectly drained phase — Hr
- Hermon loam — He
- Hoosic loamy fine sand — H
- Hoosic gravelly sandy loam — Hy
- Broken phase — Hy
- Hoosic gravelly fine sandy loam — Ho
- Hoosic fine sandy loam — Hm
- Deep phase — Hm
- Hoosic gravelly loam — Hg
- Hoosic silt loam — Hs
- Hudson fine sandy loam — Hf
- Rolling phase — Hf
- Broken phase — Hf
- Hudson silt loam — Hu
- Hudson silty clay loam — Hd
- Broken phase — Hd
- Macomber slate loam — Mm
- Shallow phase — Mm
- Mansfield silty clay loam — Mc
- Nassau shale loam — Ns
- Stony phase — Ns
- Rough stony land — Rs
- Made land — Md
- Ondawa fine sandy loam — Of
- High-bottom phase — Of
- Ondawa loam — Ol
- Orono silt loam — Om
- Dark-colored phase — Om
- Otisville gravelly sandy loam — Ot
- Pittsfield stony loam — Ps
- Shallow phase — Ps
- Podunk silt loam — Po
- Saco silt loam — Sm
- Schodack gravelly fine sandy loam — Sg
- Schodack gravelly loam — Sk
- Stockbridge loam — Sl
- Troy gravelly loam — Tg
- Sandy phase — Tg
- Walton gravelly loam — Wg
- Whitman stony loam — W
- Woodbridge stony loam — Ws
- Heavy-subsoil phase — Ws
- Woodbridge gravelly loam — Wo
- Heavy-subsoil phase — Wo
- Marsh — Ma
- Muck — Mu
- Peat — P

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
Secondary roads and Trails
Railroads Steam and Electric
Bridges, Ferry
R.R. crossings, Tunnel
Ford, Dam
School or Church Cemeteries
Mine or Quarry Mine dumps Made land
Bluff, Escarpment Rock outcrop and Triangulation station
Stony and Gravelly areas
Soil boundaries
Boundary lines
Boundary lines
Boundary lines
U.S. township and section lines

RELIEF
(Printed in brown or black)

Contours Depression contours
Prominent Hills Mountain Peaks
Sand, Wash, and Sand dunes
Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

Streams
Lakes, Ponds, Intermittent lakes
Intermittent streams
Springs, Canals and Ditches, Flumes
Swamp Salt marshes
Submerged marsh Tidal flats

The above signs are in current use on the soil maps Variations from this usage appear in some maps of earlier dates.

W. J. Latimer, Acting Inspector, District 1.
Soils surveyed by W. J. Latimer, U. S. Department of Agriculture, in charge, and C. H. Diebold, Wilber Secor, C. P. Mead, and Montague Howard, Jr., Cornell University Agricultural Experiment Station.

BASE MAP IN PART FROM U. S. GEOLOGICAL SURVEY SHEETS

Scale 1/125,000
1 0 1 2 3 4 Miles
1 0 1 2 3 4 5 Kilometers
Contour interval 20 feet.
Datum is mean sea level.

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Field Operations
Bureau of Chemistry and Soils
1932